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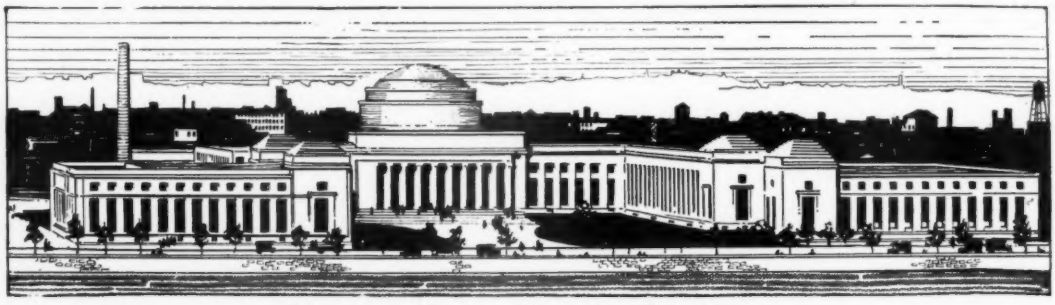

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LOOKING DOWN DEVIL'S CHASM AND ACROSS THE GREAT CHERRY CREEK CANYON, ABOUT TWENTY MILES FROM ROOSEVELT DAM. This is perhaps the most astonishing chasm in the world and offers a glorious study in color. After a painting by C. K. Bonestell, Jr. (See page 277)

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Shadows and Straws

THE ARTICLE ON PROFESSIONAL ORGANIZATION, as related to the practice of architecture, of which we are able to begin the publication in this number of the Journal, is from the pen of a distinguished English student of the social and economic problems of modern times. The American architect who reads this article will be struck with the similarity of the English problems, which Mr. Webb analyzes so skilfully, to those with which the Institute has been wrestling, vaguely and indirectly through the first four or five decades of its existence, but with a vigor which has been constantly increasing during the last ten years. The tireless process of change is making itself felt. The need for adapting the profession of architecture to ceaseless social and physical changes and demands is urging itself with an insistence which will not be denied. The profession of architecture, organized or unorganized, is constantly on trial, and the test is the quality of service which it can give. That is the test which acts as the real source of all inquiry into such problems as education and registration, both of which are prominently before the profession today and upon which the Institute is concentrating as never before.

One is struck, in this study, with the pronounced and almost antagonistic tendencies which seem to govern the evolution of the practice of architecture. Within the profession, as is clearly shown by Mr. Webb, organization was at first along social and esthetic lines. Architecture as an art was the uppermost thought in the minds of the small group which first began to foregather in London. And yet the world at large was not interested in architecture primarily as an art—nor is it to be hoped that it ever will be. Harried and pursued by the necessities of business and commercial expansion, by an ever-increasing congestion in urban centers, by a constant upward rise in the cost of building sites, by the introduction of a bewildering variety of new methods and materials, it had little time for consideration of architecture as an art. The physical and financial tests which society applied to the building were automatically transferred to the builder. Now and then the world paused in its hurried march—whither it knew not—to take the trouble to erect a public building where the financial return upon the investment had no need of consideration, and where art was allowed to alight temporarily and fan the fitful blaze with its tired wings. Out of all this struggle, between attempts to impose esthetic considerations on the one hand and the demand for the practical on the other, a chasm began to develop, and there grew up two fundamental misconceptions: first, that architecture was essentially an art which embellished and ornamented, and second, that a knowledge and love of it were to be taught by trying to explain it as an esthetic value. Now it is beginning to be seen that the primary test is serviceability, and that only out of the effort to seriously demonstrate the fact that a natural esthetic quality should grow out of a building designed primarily for useful and effective service can there come any genuine appreciation of the part that architecture plays in the advancement of a race.

This first instalment of Mr. Webb's article takes the story as far as the beginnings of architectural education in England. The next

part will go further and deal with the closely allied subject of registration.

PERHAPS THERE IS A GLIMMER of those misconceptions to which we have referred, in the following dialogue, gleaned from a hearing held by the Committee on Public Buildings and Grounds in connection with the proposal to erect a new building for the Navy Department:

THE CHAIRMAN:* Mr. Wetmore, do you not think that a monumental building such as we are speaking of could be constructed out of granite for $4,000,000?

MR. WETMORE:† An office type of building?

THE CHAIRMAN: No; I mean a building like this (referring to the plans for the building for the Department of State).

MR. WETMORE: No, sir. . . . The quickest thing that could be done in the way of constructing a permanent building for the Navy Department would be to take the plans and specifications for that building (referring to the recently completed building for the Department of the Interior) and duplicate them. The plans and specifications are already prepared.

. . . . . .

THE CHAIRMAN: That is an office-type building?

MR. WETMORE: Yes.

THE CHAIRMAN: I do not think we would want to put up a building of that sort for the Navy. We have got to have a monumental building. I think the Committee would all be agreed to that.

Earlier in the hearing there occurred the following:

THE CHAIRMAN: I do not think there is any doubt but that we will have to put a monumental building there (referring to the site selected for the State Building).

MR. BURNETT:‡ It might be monumental in size and not be of such ornate character and such ornate material as to make a very considerable increase in the price, it seems to me. For instance, I should think there would be a difference of several hundred thousand dollars in the construction of a monumental marble building of this character and the construction of one of granite. Would there not necessarily be a difference?

MR. WETMORE: There is a difference between the cost of granite and marble; yes, sir.

THE CHAIRMAN: Would not a monumental granite building be all right there?

MR. WETMORE: I think so. The Treasury is a granite building.

THE CHAIRMAN: Do you think the Commission of Fine Arts would object to that?

MR. WETMORE: I do not think they would object to a granite building, but they would probably object to a tall building there.

THE CHAIRMAN: Would they object to a limestone building of this character?

MR. WETMORE: Well, I cannot say what they will object to.

THE CHAIRMAN: Would a building constructed of limestone be monumental?

MR. WETMORE: Yes, sir; we build monumental buildings of limestone.

And still earlier in the hearing one finds the following:

MR. BURNETT: . . . Would it not be possible for the Navy Department to state to us, in order that we might put it in the bill, the character of material they want, whether they want marble, granite, or limestone? That is the trouble we had with the Fine Arts Commission, that they were insisting on a monumental building or a marble building and insisting on constant increases. If you gentlemen could come down to that I think we could keep out of the clutches of that Fine Arts Commission to a great extent . . . The Fine Arts Commission held us up for years on that building, where people were being murdered, because they wanted a certain kind of material used and would not approve anything else. . . .

It would appear, from these dialogues, that the word "monumental" as applied to architecture had acquired a connotation greatly detrimental to an understanding of the functions of the architect when called upon to design a building of the character under discussion. "Office-type" also is alluded to, one feels sure, as a deprecatory qualification, and thus the real basis upon which such a problem should be considered becomes fogged and lost to sight. The truth is that a building of the so-called office type is essential for the effective conduct of the business of a great governmental department. We are so prone to criticise governmental machinery as unbusiness-like that it is hard to understand why we should not warmly welcome the the introduction of business features, such as ample light, maximum floor-space, convenience in plan, and facility and economy of operation, in a departmental building for the United States Government. The problem begins right there and should be studied from that basis. It is, then, the functions of the architect to combine those indispensable factors with an exterior which shall express the dignity of the Nation, for whose service the building exists. Modern needs will not be met by grouping a collection of motifs from Greece and Rome under the guise of "monumental," nor will the Nation be satisfied with the average type of commercial

*Mr. Clark, of Florida.
†Acting Supervising Architect.
‡Of Alabama.

structure for a departmental building at Washington. To effect this reconciliation between physical needs and beauty of line and form is the province of the architect. To understand the proper relation of these factors is to grasp the principle upon which architecture rests as an art.

One also notes the falsity which has crept in through the use of the words "Fine Arts" as applied to the Commission which is charged with trying to safeguard Washington against objectionable structures. The name does not connote a body which is dealing with practical things. It savors of something fussy, flossy, ornamental, decorative—a useless appendage to a practical problem. Yet the Commission of Fine Arts deals with practical problems and suffers the reproaches we have chronicled merely because, mistakenly it was given a name which does not express its purpose—any more than "fine arts" expresses the purpose of anything else. It is dangerous to try to force appreciations by using words which first evade definition and then acquire queer connotations.

THE ANNUAL REPORT of the Council of the R. I. B. A. for the year 1916–17 is of unusual interest. Tragic are the records of the seventy-six members who have lost their lives in the war; yet inspiring is the simple narrative of what the Institute has contributed toward helping the country in its need. We gain an insight into the great problem of readjusting employments to meet the business of war, and find that the R. I. B. A. was able to show the Government how useful architects could be in all sorts of work for which their training had especially fitted them. The work of a special committee appointed to advise with the Government as to what kind of trees should be planted for providing future timber for building purposes indicates a phase of war destruction from which we have heard that England has not been spared, though uninvaded.

Out of its trust funds, the Institute was able to invest nearly $8,500 in the war loans, and by careful economy and wise financing was still able to carry forward a balance of $2,000 to the new year. The Journal has been reduced in size and published monthly instead of fortnightly, and the Kalendar has been briefed, giving only lists of new members, changes of address, and fixtures for the new year. The report is significant of the high degree of skill with which the Royal Institute has organized the architectural profession of Great Britain. It is a fine showing after three years of a war which has tried nations as never before.

MEMBERS WHO HAVE JOINED THE FORCES since the outbreak of the war number 72 Fellows, 513 Associates, 312 Licentiates and 293 Students, a total of 1,190.

The Royal Gold Medal was awarded to Sir R. Rowand Anderson, LL. D., F. R. S. E. (*F.*). This year the medal will be presented, at the General Meeting on June 25, to M. Henri Paul Nenot, Membre de l'Institut, architect of the new Sorbonne in Paris, in recognition of the merit of his executed work.

In the report of the Literature Standing Committee one is impressed with the attention paid to the Library of the R. I. B. A., and the amount of interest taken in its enlargement and improvement. The contributions of measured drawings and sketches are numerous. During the year 1,220 members and 999 non-members used the library, which must be taken as a further indication of its value.

Homes for Workingmen Built by the City of London

By W. F. RILEY, F.R.I.B.A.*

THE procedure in dealing with the practical problems involved in clearing away slums and erecting in their place good healthy buildings is a matter which has been favorably solved in England, where the authorities are vested with powers much more comprehensive than those enjoyed by municipalities in America. Specifically, in the housing operations carried out by the London County Council, accommodations have been provided for nearly 60,000 persons in buildings erected by the city. Nearly 50,000 people have been displaced by the demolition of old and unsanitary buildings.

*Superintending Architect of Metropolitan Buildings and Architect to the London County Council.

By a parliamentary act of 1890 (Section 38, Part 1) the authorities may initiate proceedings for the demolition of old houses on representations from a medical officer of health. The same authorities may also undertake the construction of new buildings for the rehousing of the displaced. The law requires that the buildings must be on the area formerly occupied by the old structure or in the immediate vicinity. The law permits in the same operation the widening or closing of existing thoroughfares and the construction of new thoroughfares. Under Part II of the same act, the city authorities may remove buildings which obstruct light and air about adjacent buildings. This portion of the act applies to areas too small to be of general importance.

As to the comparative utility of Part I (for the clearance of unsanitary areas) or of Part II (for the removal of buildings which obstruct light and air of adjacent buildings) experts differ. Advocates of Part I contend that nothing but an immediate scheme can effectively remedy the conditions in a particular area, and that the demolition or repair of isolated obstructive buildings only produces a patchwork result and aggravates unsanitary conditions elsewhere. Whether Part I or Part II shall be applied to any particular area must always be a problem for determination according to the special circumstances of each locality.

In the work in the central sections of London, however, under Parts I and II of the Act previously referred to, it has been found necessary to charge rents based on the housing value only. It has been found practically impossible to provide accommodations in the old centers at rents equal to or lower than rents ruling in the neighborhood, so that in such improvements all or part of the value of the land has been discounted by the municipalities. In other words, the commercial value of the cleared sites has had to be written down to housing value and the loss to the municipality has had to be distributed as a part of the taxation on property throughout the city.

But without complying with the statutory obligations, the London County Council voluntarily has provided housing accommodations in unbuilt-up areas under the provisions of the Town-Planning Act of 1909. Estates have been purchased on the outskirts of the county where land has a low value and cheap and rapid traveling facilities exist. In these operations, an essential requirement not applying to those previously referred to is that they must be self-supporting. Notwithstanding this fact there is an actual saving in rent to the tenant by living in one of the suburban sections laid out by the London County Council. Obviously, the great need of London is the building of more adequate rapid transit facilities in which connection would be made with the virgin territory in the country for a single fare. The Town-Planning Act for 1909 was a distinct step in the direction of a solution of the problem with which the London County Council is confronted. This Act provides not only for the limitation of the number of houses to the acre but also for the provision of adequate light and air and does away with the overcrowding of large masses of population. As noted above, it is under this Act that the development of the cottage estates in London by the County Council has proceeded.

To refer briefly to the development of the suburban cottage estates of the London County Council, the houses are two-story buildings arranged in short terraces with space at intervals, and they are almost invariably set back five to fifteen feet from the fore-court fence. The schemes for development have been largely influenced by the following considerations:

1. Economy of land area and road construction in proportion to the building.

2. The avoidance, so far as practical, of deep external back projections in close juxtaposition.

In the development of these estates every endeavor has been made successfully to combine commerical and architectural values. Variety in planning the treatment of the elevations has been consistently aimed at. A feature of the County Council estates is that each cottage has its own plot of ground at the rear. The conclusions which have been drawn by authorities in London are that from the educational, social, hygienic, and in fact, from nearly all practical aspects, the proper way of housing workers is at the outskirts of the city or town where convenient transit should be made a part of the scheme.

The Organization of the Architectural Profession*

By SIDNEY WEBB, LL.B.

Professor of Public Administration in the University of London (School of Economics and Political Science)

Early Records of Architecture as a Profession

WE need not, for our present purpose, inquire by whom either the cathedrals or the castles of the Middle Ages were constructed, nor discuss how far William of Wykeham (1324–1404) or John Thorpe (circa 1570–1620) can be considered to have contributed to the foundation of an architectural profession. The first known use of the word in English seems to be in 1563 when John Shute, on the title-page of what was perhaps the first book that this country produced avowedly on architecture,† styled himself "painter and architect." Inigo Jones (1573–1671) is commonly said to have been the first definitely professional architect in England. In Italy, Inigo Jones found architecture, though its greatest glories were past, still intimately connected with the arts of painting and sculpture. In England, as it seems, the profession emerged from other surroundings. For yet a couple of centuries after Inigo Jones the work of the architect continued to be only very partially marked off from that of the master mason or building contractor on the one hand, and from that of the surveyor or the civil engineer on the other—an association from which the architect in some other parts of the world, and even in some provincial towns in this country, has not yet shaken himself free. Sir Christopher Wren (1632–1723), it will be remembered, at the end of the seventeenth century, was "Surveyor of His Majesty's Works and Buildings," and combined with the exercise of his genius as an architect very considerable duties of what we should now class as surveying, building, and civil engineering. Thomas Telford (1757–1834), engaged in 1787 as Surveyor of Works for the county of Salop, did, in the course of his life, much work as a mason and a clerk-of-the-works, a roadmaker and a bridge-builder, a surveyor and an architect, though we think of him now as essentially a civil engineer.‡ During the seventeenth and eighteenth centuries there lingered still the traditional skill of the craftsmen in stone and brick and wood who dealt direct, each for his own specialty, with the customer who desired a house. To them, as much as to any professional architects, we apparently owe the taste and charm of so many of our old cottages and country houses. From the middle of the seventeenth century in London, and during the following hundred and fifty years elsewhere, we see these master craftsmen becoming more and more superseded by the contracting builder, who took all trouble off the customer's hands, himself supplied all the necessary materials and hired the wage labor, and speculated to the extent of undertaking to produce the building for a fixed sum. We do not know how the two changes may be connected, but, in the United Kingdom at any rate, the coming in of the professional architect corresponded closely with the employment of the contracting builder. In some cases the same person filled both parts.**

*The materials for a sketch of professional organization among architects in the United Kingdom are to be looked for mainly in the records and published "Proceedings" (1835–93), "Transactions" (1836–93), and *Journals* (1893–1915) of the R.I.B.A., together with the annual R.I.B.A. Kalendar; in the records, and *Journals* (under various titles from 1889) of the Society of Architects, together with its annual "Year Book;" in the records and annual "Notes" (1887–1904) and *Journal* (1905–15) of the Architectural Association; and in the publications of the local "allied societies," together with those of the few others not in alliance with the R.I.B.A. See also "Architecture, a Profession or an Art," edited by R. Norman Shaw and T.G. (afterward Sir Thomas) Jackson (London, 1892 xxxv+240 pp.); the article on "Architects" by Alfred Waterhouse, in "Unwritten Laws and Ideals," by Miss E. H. Pitcairn (London, 1899); "The Legal Registration of Architects," by J. Wreghitt Common, F.R.I.B.A., 1888; "As to the Making of Architects," by Maurice B. Adams, F.R.I.B.A., 1904; "The Consulting Architect," by Robert Kerr (London, 1886, 313 pp.); "The Architect as the Arbitrator between the Employer and the Contractor," by C. G. Gregory (London, 1891, 340 pp.).

†"The First and Chief Grounds of Architecture used in all the ancient and famous monuments, with a further and more ample discourse upon the same than hitherto hath been set out by any other," by John Shute (folio, 1563 and 1584).

‡In contrast with these English examples of the seventeenth and eighteenth centuries, we may cite such eminent Italian architects as Giotto, Brunelleschi, Bramante, Michael Angelo and Sansovino, who were, to say the least, scarcely less distinguished as painters or sculptors, some of them working with success in all three branches. The present most authoritative meaning of the word architect is "a master builder; a skilled professor of the art of building whose business it is to prepare the plans of edifices and exercise a general superintendence over their construction." (*Murray's New English Dictionary.*)

**Thus, already three centuries ago, we find Robert Smithson (1585–1614) who designed much of Longleat, described as "undertaker and overlooker." Robert Timmins (1618–35) who designed Blickling Hall in Norfolk, is termed "architect and builder." Sir Thomas Chambers and Robert Adam both contracted to supply houses to their clients at fixed sums, sometimes including not only design and building, but also much of the furniture. Much of West London was erected by the enterprise of those who were both architects and building contractors. George Cooke, to whom we owe the foundation (in 1786) of the first professional journal, *The Builders' Magazine*, is only one of many who avowedly combined the two callings of builder and architect.

The First Societies

But in the London of the latter part of the eighteenth century there gradually drew apart a small class of practitioners who catered principally for the wealthy noblemen and gentlemen of artistic tastes, and who, in contrast with the "builder-architect" of the suburbs, as of the provincial towns, limited their functions to those of the architect as we now understand the term. Not until the very end of the century do we find any coming together of these professionals. There was an Architects' Club from 1791 onward, in which a select company of leading men in the profession foregathered at the Thatched House Tavern in St. James's Street. This friendly social gathering included such distinguished members of the profession as Robert Adam, Chambers, Soane, Wyatt, Milne, Dance and S. P. Cockerell, but seems to have exercised no definitely professional functions.* The London Architectural Society, established in 1806, appears to have been merely an organization for mutual improvement, its members binding themselves each to produce annually an original drawing and an essay, which were discussed at general meetings. This society apparently died out some time before 1831. The Architectural Society, established in 1831, was a more ambitious attempt at a learned society, intending to found a school of architecture and hold annual exhibitions, but had only eleven years' rather abortive existence. In 1833 appeared *The Architectural Magazine*, the first exclusively architectural journal. Meanwhile, what was destined to become a more substantial organization arose. In February, 1834, there was a meeting of London architects and surveyors for the purpose of forming a new society for the study of architecture and architectural topography.† Those among them who were architects seem to have preferred a separate association and drew apart in July, 1834, to form The Institute of British Architects. It was this group of architects who, after three years rather informal existence, obtained a charter in 1837, thenceforward styled itself the Royal Institute,* basked in the sun of courtly and other influential patronage, was honored by the foundation of an Annual Royal Medal in 1848, obtained new charters in 1887 and 1909, and has gradually grown into the position of the dominant organization of the profession throughout the whole British Empire.

*See the article by Harry Sirr, in *Journal*, Jan. 7, 1911.

†"An Historical Sketch of the R.I.B.A.," by C. L. Eastlake, Secretary, 1876.

The Purely Social Purpose of Early Organizations

Those who founded the Institute neither troubled to define the qualifications for the architect's profession nor to prescribe any particular kind of education for those seeking entrance to it. They were clear, it seems, that they did not want to associate themselves with surveyors, who were then principally "builders' measurers;" but in 1835 the infant Council discussed "whether it be consistent with the constitution of the Institute to admit as Fellows such gentlemen as are chiefly known and distinguished as Civil Engineers."† The decision was apparently in the negative. The members, indeed, thought of themselves as artists, and their report to the little annual meeting of 1836 justifies the formation of the Institute by the plea that the Royal Academy, to which it seems to have been supposed that they might have owed some allegiance, had given up its lectures on architecture and failed to make accessible any architectural library—was composed, in fact, almost wholly of painters and sculptors.‡ There was, at first, no thought of establishing a large or far-reaching organization, or, indeed, of a professional association at all. The members, it has been said, "were selected at first for their respectability and not necessarily for their talent. . . . It was . . . considered desirable by its founders that none should join its ranks who were not gentlemen by education and social status."** The founders of the Institute were, indeed, a little group of architects of artistic tastes, who had found success in carrying out the projects of cultivated

*The title of Royal Institute appears to have been commonly used from the first, although express permission by the Queen was given only in 1866.

†Summons to a Council Meeting of 1835. Sir John Rennie had been invited to one of the preliminary meetings.

‡Annual Report 1836.

**"Architects," by Alfred Waterhouse, in "Unwritten Laws and Ideals," edited by E. H. Pitcairn, 1899, p. 344. It is fair to note, however, that among these early members were some of the most distinguished architects of their day: we need only mention the names of Donaldson, Tite, Barry, Decimus Burton, Cockerell, Gilbert Scott, and Gwilt, to whom were presently added Hardwick, Burges and Pearson.

clients. What they sought was not any widely extended membership, still less the regulation throughout the whole Kingdom of what was already a widespread straggling profession, but the formation of a "subject association" for the development of architecture, largely by the bringing together in pleasant social intercourse of its more successful votaries, and especially those who were "free from those complicating relations with trade which frequently existed in the early part of the century, and prevented that implicit confidence on the part of the public which should enable a client to regard his architect not only (as free from) the receipt or acceptance of any pecuniary consideration or emolument from builders or other tradesmen whose works they may have been engaged to superintend on behalf of others," or having any "interest or participation in any trade contract or materials supplied at any building whereof they may be engaged to superintend the execution or elsewhere;" or any other conduct "derogatory to the character of a gentleman in the practice of the profession;" but specifically also "engagement in measuring and valuing or estimating on behalf of builders, except those executed under the architect's own directions."* The Institute was not confined to professional architects. As a "subject association," it rightly welcomed those whose interest in architecture was that of the amateur. The Institute depended, in fact, largely on donations from wealthy patrons of its art. "Without and beyond the circle of its professional members," declared a published appeal, it will "at first be difficult to form and carry on such a society," so the architects relied, as they frankly said, "on the munificence which distinguishes so many noblemen and gentlemen in this country." Nor did they rely in vain. For years the receipts from these amateurs formed more than half the annual revenue of the Institute. The presidency was held right down to his death in 1859 by Earl de Grey, who (except when he was holding office in Ireland) attended every meeting of the Council, took the most active part in the proceedings, sumptuously entertained the members at his house, and secured for the Institute a series of courtly favors. The Institute remained a select coterie interested in the development of architecture, rather than in the promotion of the profession; not aspiring to any regulative authority, not concerning itself about professional education; only slowly becoming much more than a London and indeed a West End body;* and occupied almost entirely with the friendly relations and pleasant social intercourse among its own members, for which the meetings, the slowly growing library, and the annual award of the Royal Medal to a distinguished British or foreign architect afforded convenient occasions. It made an attempt in 1837 to organize lectures for its members on geology and chemistry and on the different kinds of timber—a "mode of conveying instruction in practical architecture and the new branch of knowledge now first brought to bear upon construction," which, as the Council observed, was "somewhat of a novelty in the profession." But the members did not attend in any numbers, and the experiment was not continued. In 1838 an attempt to absorb the Architectural Society was defeated, owing, it seems, to the refusal of the Institute to take over the surveyor members of the Society.† The remnant of this Society was absorbed in 1841, without apparently greatly affecting either the membership or the activities of the Institute. Its principal professional interest appears in these years to have related to the way in which its members found themselves generally excluded from the execution of public buildings, owing to the devotion of both the national and local governing bodies, and also of trustees and committees, to the crudest form of open competition among architects in the submission

*Address of the Institute of British Architects explanatory of their views and objects, and the regulations adopted at a meeting held July 2, 1834.

The prohibition to architects to engage in quantity surveying (which has since been developed into a distinct profession having its own Quantity Surveyors' Association) requires explanation. What was aimed at was the practice, to which many architects, especially in the provinces, then succumbed (as some are said still to do), of taking out the quantities for the builder, at the builder's request, and receiving payment (usually at 2½ per cent on the total amount) *from the builder* unknown to the client. What was objected to was this concealed relationship and commission. Where the architect, to the knowledge of his client and at the client's expense, takes out the quantities from his own plans and supplies them to the builder without receiving from him any payment whatsoever, the practice is not open to objection. In this form it may be convenient (or even necessary where the professional quantity surveyor is not at hand), and it has been forcibly upheld. "The quantities," it has been urged, "are never so well taken out as when the architect himself does the work, or has it done in his office, because he alone can know clearly what is in his own mind." ("The Consulting Architect," by R. Kerr, 1886, p. 197.)

The Institute's prohibition, expressed in somewhat vague terms, was objected to by many provincial architects and was (as regards Associates) rescinded by vote of the annual meeting in 1850, and (as regards Fellows) quietly dropped out of the revised form in 1887.

*It should be noted that in the very earliest years a few architects practising outside London (as at York, Gloucester, Plymouth, etc.) were admitted.

†"An Historical Sketch of the R.I.B.A.," by C. L. Eastlake, 1876.

of plans. In 1839, and again in 1843, the Institute fulminated against this abuse, declaring that "there are few cases in which competition is anything but a convenient engine for fraud," and "that the modern practice of submitting designs in competing speculations for premiums, or for employment, or in any competition for preference, without specific or properly implied promise of certain payment to each and every competitor, operates injuriously upon architecture and upon the interests and character of the profession." It is interesting to find an almost total absence of mention of the methods of preparing for or entering the profession. In 1841, indeed, the existence was recognized of "students," who, in return for an annual subscription, were admitted to the library and meetings on the recommendation of members, but for whom no education was provided. Their numbers never rose, however, to more than a handful. The Institute itself continued for years to have only a hundred or so professional Fellows and Associates. The membership long remained almost stationary.* In 1839, when there were still only a couple of hundred Fellows and Associates on the books and considerable difficulty was experienced in inducing even these to pay their annual subscriptions, a committee was appointed to inquire why greater progress was not being made. A great obstacle to membership was the prohibition to engage in quantity surveying, which was then very commonly combined with practice as an architect. The controversy raged over a couple of years. After hot discussion a majority of the Council refused to give up the prohibition, even for the sake of enrolling more of the provincial architects. The annual members' meeting in 1850 took, however, a different view and rescinded the prohibition. In 1855, when a new metropolitan building act was passed, the Government entrusted to the Institute, as being the only available professional body, the duty of conducting the technical examination of architects who wished to obtain "certificates of competency" to hold the office of "building policeman" or Public Inspector of Building Plans in London, misleadingly styled that of District Surveyor, or, as various Local Acts put it, Building Surveyor.

*In 1837 there were (apart from non-professional and other honorary members) 64 Fellows and 33 Associates. In 1846 there seem to have been still only a hundred actually subscribing, though in 1849 the numbers on the books were 110 Fellows and 96 Associates, and in 1851, 120 Fellows and 96 Associates.

The Development of the R.I.B.A.

In the year 1859, when Earl de Grey died, a professional architect was elected to succeed him as president, new and more commodious premises were obtained, and the Institute entered into a new phase. The membership rapidly increased, especially in the provincial centers, and the Institute took on a more strictly professional character. The presidency was thenceforth held normally only for two years. The donations from wealthy amateurs, rewarded by Honorary Fellowships and Honorary Memberships, ceased to form an important item in the revenue. Though the Council of the Institute continued to be made up mainly of architects who had achieved opulence and distinction on the old lines, the Associates, and even the Fellows, came to include more and more of the rank and file of men engaged in the erection of shops and factories, mills and offices, and the mass of ordinary dwelling houses with which so much of the country was being covered. The technical and commercial aspects of the architect's duties obtained greater attention. The Institute was ceasing to be predominantly metropolitan in membership, and, moreover, it was not the only society to which architects could belong. The profession was, indeed, rapidly spreading to every large town. Local societies were formed in which architects could meet and discuss their common interests. In Dublin the Royal Institute of the Architects of Ireland had been established on the model of the British Institute as early as 1839. In the course of the next half a century local societies with divers titles were started in Liverpool (1842), Bristol (1850), Newcastle (1858), Edinburgh (1858), Nottingham (1862), Manchester (1865), Glasgow (1868), Leicester (1872), Birmingham (1873), Leeds (1876), York (1882), Dundee (1884), and Sheffield (1886), to be followed in 1890 by the South Wales and Devon and Exeter Societies, in 1898 by the Aberdeen Society, in 1911 by the Northamptonshire Society, and in 1912 by the Hampshire and Isle of Wight Association. These societies, which were completely autonomous, framed their own definitions of the limits of the profession, fixed for themselves the districts that

they would take for their several spheres, elected their own Fellows and Associates, admitted their own students upon such qualifications as they chose,* and, in some cases, added not only "Honorary Members" or "Honorary Associates," but also such new classes as "Lay Members," and "Associated Craftsmen," who are certainly not architects.†

These local organizations—now known as the "allied societies"—were not hostile to the Royal Institute, nor did they presume to be its rivals. On the contrary, they looked up to it as the premier society of the profession; and many of their leading members belonged to it as Associates or as Fellows. During the quarter of a century that followed on the expansion of the Institute in 1860, the numbers of these provincial societies—whether born and mainly trained there, or merely migrants from London who had settled in practice there—were, in fact, during the latter part of the nineteenth century, coming to constitute a considerable proportion of the Institute membership, which thus lost, by imperceptible degrees, its original character of a select group of personal acquaintances.*

The members of the Council of the Institute, who continued down to 1894 to be annually elected (and usually year after year reëlected) at the annual meeting of members in London, seem to have looked upon these changes with mixed feelings. There were some, even among the leading members, who wished the Institute to pass away from being merely a "subject association" and to take on avowedly all the functions of a professional association, aiming, for this purpose, at representing the whole profession and not merely its most distinguished or most successful members. In 1865, reverting for once only to the tradition of the first president, the Institute elected, not a professional architect, but that accomplished and distinguished dilettante, A. J. Beresford Hope, to fill the presidential chair. In his inaugural address the new president made for the Institute claims larger than its dominant members were then inclined to support. "I am ambitious," he said, "for the honor and usefulness of the Institute, and as the result of this ambition, I decline to remain where we are . . . The Institute ought to be, without rival and without demur, the central regulating areopagus of architecture—as practised by its professional votaries and as studied by the amateur—within this Imperial realm. The time should come when the absence of those letters which denote some grade in the Institute from the name of anyone who practises architecture should be as much the cause for inquiry as the absence of academic distinction from that of the clergyman who has the misfortune to be a Literate. Do not mistake me, and imagine that I am the mouthpiece of any policy of aggression; least of all do I wish to crush the free art-life which has given birth to so many architectural and semi-architectural societies . . . I wish them all prosperity and all liberty; at the same time I desire that they

*Thus, the Royal Institute of the Architects of Ireland requires its students to have signed articles for three years to a member of the Institute, or of the R.I.B.A., or of an allied society; the Glasgow Institute insists that its Fellows, if not F.R.I.B.A., shall have gone through a six years' apprenticeship in an architect's office, recognized as such by the Council; the South Wales Institute requires its Associates to have been assistants or pupils under articles to qualified architects, unless the Council relaxes this rule in particular cases; and the Devon and Exeter Archæological Society requires either service under articles or some other training recognized by the R.I.B.A. Service under articles is, however, with the growth of schools of architecture, becoming steadily less usual and, where it continues, much curtailed.

It may be noted that the Edinburgh Architectural Association admits as Associates the apprentices, pupils, or assistants of civil engineers or surveyors, as well as of architects and also junior designers; the Leicester and Leicestershire Society of Architects admits as Assistant and Pupil Members those over 16 "in the office of an architect, surveyor or civil engineer, in practice in the Counties of Leicester or Rutland;" and the newly formed Hampshire and Isle of Wight Association of Architects admits as Associates "gentlemen engaged in public offices to do architectural work."

†Some of these "allied societies" are open, according to their rules, to persons merely interested in architectural matters, or "in the furtherance of the work of the Association"—a lack of definiteness sometimes animadverted on. But it is understood that the number of such non-professional members is infinitesimal.

Upon being accepted as allied societies, these local organizations become entitled to receive 25 per cent of the subscriptions paid by any of its members to the Royal Institute as Fellows, Associates or Licentiates, and any change in the rules or by-laws have to be approved by the Council of the Royal Institute.

The position of the Ulster Society of Architects is peculiar. It was formed at a meeting at Belfast, convened by Sir Thomas Drew, F.R.I.B.A., President of the Royal Institute of the Architects of Ireland. It was subordinate to the R.I.A.I. and had two representatives on the Council of that body. In the year 1906 friction had developed between the two bodies. Belfast said that Dublin was too far away, paid no attention to Ulster interests, had a lower standard of professional practice, etc. The Ulster Society seceded and applied for direct alliance with the R.I.B.A. as an independent society. Dublin objected to this dismemberment of its province. The demand for alliance with the R.I.B.A. has been renewed annually since 1906. The R.I.B.A. Council has consistently refused to make any change, except on the basis of an agreement between Dublin and Belfast.

*The Subscribing Membership of the R.I.B.A. has been as follows in the years mentioned:

1850	215	1905	1,904
1860	324	1910	2,353
1870	520	1911	*3,626
1880	796	1912	*4,330
1890	1,367	1913	*†4,632
1900	1,678	1914	*4,673
1915	*4,641		

*Including Licentiates.

†No further admissions to Licentiateship after this year.

should all act as members of one system . . . looking up to this Institute as the Alma Mater, ready to give all fostering care at the cheap price of unsuspicious confidence."* The conception of a united architectural profession, all of them becoming members of the Institute, failed to find favor among those who at that time ruled its destinies. Yet the membership steadily grew, and with the membership the professional influence. With its growth the Institute was, in fact, taking on new functions. Its position as the predominant society led to its being pressed to undertake such duties as seemed from time to time to be imposed on an organization representing the profession. Presently it made itself national in constitutional structure, and, later on, definitely Imperial in its scope. In 1889 nine of the local societies, and subsequently ten more, were admitted to affiliation, with representation on the Council in the persons of their presidents taken in a certain rotation. In 1892 the Royal Institute gave itself a further extension of scope by admitting to affiliation (though without representation on the Council) the Institute of Architects of New South Wales, a step followed, between 1907 and 1913, by similar admission of nine other architects' organizations of the Canadian, Australian, New Zealand and South African Dominions. The increased membership and greatly extended activities of the R.I.B.A. were, however, accompanied by a certain loss of prestige among a section of the leading architects. Some of the most distinguished members of the profession felt that the Institute was no longer what it had been. They had not much resented the transition from a select gentlemanly club, in which social position was even more regarded than professional eminence, into a widespread association of national and international influence. But other developments were taking place, to which we have now to allude, in the way of the deliberate training of men to be architects and of subjecting them to examination tests, against which these distinguished members of the profession revolted. They demurred to the transition from the "subject association" to the professional association. They resented what they declared to have become "the constantly avowed desire" of the Institute "to make itself co-extensive with the profession, by sweeping all architects into its net."*

They had no taste for anything like a scientific society or an active professional organization. To them, as to Earl de Grey, to whose influence the Institute in its first quarter of a century owed so much, the duty of the Institute was the promotion of architecture as one of the "fine arts;" the function of its members was not to direct and supervise the erection of all the buildings of their country, whatever they were, but only to design and plan such among them as were intended or desired to be beautiful;† that they were, or should be, essentially artists, not to be organized as if they were civil engineers, or professionally instructed like district surveyors. Moreover, as the Institute had continued to elect as Associates and Fellows any architects whose personal character and professional reputation commended itself to the little group of the Council and other active members, it cannot be said that its membership commanded universal respect.‡ Thus, in contrast with the history of most professional organizations, the R.I.B.A. has not the record of a steadily progressing inclusion of all the leaders of the profession. It started with the idea of including the most gentlemanly and respectable, among whom, it was assumed—at that time not altogether incorrectly—would be found the most successful and the most distinguished. Toward the end of the nineteenth century, when the total membership had risen only to some sixteen hundred, there may well have been as many of the leading architects outside the Institute as within; and some of the most artistic, the most cultivated, and the most distinguished members of the profession preferred to be without the initials F.R.I.B.A.

Such was the position toward the end of the nineteenth century. The last two decades have witnessed a bewildering change, which it is difficult to analyse. We have to note the con-

*Inaugural Address of A. J. Beresford Hope, Nov. 6, 1865, in "Transactions, R.I.B.A.," 1865–6; see also *The Builder*, Oct. 29, 1887, p. 590.

*"Architecture a Profession or an Art?" by R. Norman Shaw and T. G. Jackson, 1892, p. xxxi.

†"For nine buildings in ten, if not ninety-nine in a hundred, no architect is, or perhaps ever will be, required." (*Ibid*, p. xv.)

‡In 1892 it was said, with some bitterness, that about half the members of the Institute "are surveyors who only devote a fraction of their time to architecture." Twenty-two leading architects, all men of distinction, signed the memorial against registration in 1892, as persons wholly unconnected with the Institute. Seven of the best-known Fellows at the same time resigned their Fellowship (*Ibid*, p. xxxv), as a protest, not entirely or even principally against the policy of registration but essentially against the Institute becoming a professional association, or, as they said, a trade union.

tinuous development of systematic professional education for architects. We have to record the advent of the fiercely resented system of examinations on which membership of the Institute has come, in practice, to depend. We see a great increase in the numerical strength of the profession and its ever-wider geographical dispersion. And with all this, it is clear that professional organization among architects in the British Isles has become more general, more active, and, as it seems, more effective. The two main factors in this transformation in professional organization—at first the cause of disaffection and disunion, but during the last few years, as we read it, actually becoming the means of bringing the whole profession closer together—have been the desire to promote a real professional training for those desiring to be architects, and the aspiration after an authoritative registration of those qualified to exercise the profession. Under the influence of these factors we see the R.I.B.A. continuously increasing its strength, its activities, and the range of its influence; we note the steady development of the educational work of the Architectural Association and the upgrowth of other "recognized" schools of architecture; and we become aware of the rise of a new body, the Society of Architects, devoting itself specially to the movement for statutory registration. These results have not been achieved without controversies which have sometimes been fierce and bitter. But the center of discussion has, it seems to us, almost imperceptibly shifted; and whilst, on the practicability or even the desirability of statutory registration, opinion is still divided, those who think of architecture as a branch of the arts have joined hands with those who are conscious of its needs as a profession, so that it seems as if, today, among reputable and successful architects in general practice on their own account, only a small minority of the older men still deliberately stand aloof from professional organization.

The First Realization of the Problems of Architectural Education

In a certain sense it may be said that, more than anything else, it has been a growing realization of the need for the systematic instruction of the architectural aspirant that has drawn the profession together. Throughout the greater part of the nineteenth century the youthful student of architecture practically "picked up" his profession by serving, under more or less formal apprenticeship or "articles," in the office of a practising architect, who, in return for a not unsubstantial fee—in London usually three hundred guineas—gave his pupils for five years* the run of his office, allowed them to help in his work, and afforded them such hints and advice for which he found time and inclination. The student might attend a drawing-school and study such plans and designs or read such books on building construction and on architecture in past ages and in other countries as those to which he could get access. He acquired only such practical knowledge of geology, chemistry, and civil engineering as he chose. More generally he satisfied himself by joining a sketching club which visited buildings of architectural interest. As a distinguished member of the profession has put it, "he might there become a fair draughtsman and, by dint of application, learn to write a specification and prepare detail drawings of more or less use, but of systematic architectural education there was none."† At the expiration of his term of apprenticeship the student often found paid employment for a few years in the office of other and perhaps busier architects as an assistant, and thus increased both his professional experience and his knowledge of what may be called the business side of his work, before starting in practice on his own account.‡ This freedom to "pick up" the profession by working under one or more of its masters, without systematic or formal instruction, has, it is claimed, the advantage of affording free scope to artistic talent; and, when the master is himself a genius, of giving the best chance of inspiration. But apart from the fact that the majority, even of the masters, are not at any time likely to be men of genius, nor the majority of

*University graduates were often articled pupils for three years only.

†"Architects," by Alfred Waterhouse, in "Unwritten Laws and Ideals," by Miss E. H. Pitcairn, 1899, p. 344.

‡The Institute keeps a useful register for assistants seeking employment, which is open also to pupils and "improvers," and also to clerks-of-works. It should be noted that a certain proportion of trained assistants, failing to get into practice on their own account, or to get a sufficiently well-paid assistantship, take employment, after a few years, as clerks-of-the-works, "whose duty it is to be constantly on the works to see that every item of the contract is carried out in strict accordance with the agreement" ("Architects," by Alfred Waterhouse, in "Unwritten Laws and Ideals," by Miss E. H. Pitcairn, 1899, p. 352–3), a class recruited also from builders' foremen, builders' clerks, and from those who have been unsuccessful as master builders. The clerk-of-the-works is selected by the architect but paid by his client. There is a separate Clerks-of-the-Works Association which looks after their interests.

students to be very receptive of inspiration, the range of practice and the character of the experience of any one professional, even in the best case, is necessarily limited; and the arrangement affords no assurance that the student, however artistically promising, would acquire that knowledge of all the practical devices of the art of construction, without which the best possible drawing will not result in the most useful or even the most beautiful building; nor yet that acquaintance with business methods and of the laws and regulations controlling the erection and alteration of houses without which the architect cannot successfully serve his clients.*

It is only fair to note that three-quarters of a century ago the need for the formal and systematic instruction of the young architect was less than it is today. There was at that time scarcely more than one conventional style, in which all those buildings were constructed on which architects were employed. Any articled pupil, in any office, might therefore count on getting acquainted, in the course of years, with the commonly accepted run of designs. There was, in any particular locality, but little variety of building material available, and the different kinds of buildings for which architectural designs were called for were few in number, so that it may almost be said that all architects handled the same things to much the same purposes. Moreover, the requirements of laws and by-laws like the demands of sanitation and ventilation, were restricted and simple. It was not then so unreasonable as it seems today to contend that apprenticeship to an architect in good practice provided practically all that could be taught. The first disturbance of this complacency was brought about by the now forgotten "battle of the styles." When the revival of Gothic and the introduction of this and that startling innovation broke the uniformity of architectural convention, the pupils in different offices found themselves limited in design to the practice of their several principals, and a demand arose for some wider and more varied instruction in design. The successive employment of new materials revealed the need for almost an engineering knowledge of the mechanics of construction. Finally, the increasing demands of sanitation and ventilation, and the obligations imposed upon the architect by the ever-growing mass of legal regulations, made it necessary for even the most artistic of architects to apply himself to an unfamiliar branch of study.

The movement to provide and ensure a more complete professional training for architects took two main forms, the organization of systematic public instruction and the institution of examinations. To enable the architectural pupils and youthful architects of the metropolis to get a fuller and wider instruction than they could pick up in the respective offices in which they were engaged, the Architectural Association was established in 1847 as a separate body, under the wing of the Institute, at first even sheltered under its roof, and always largely run by its Fellows and Associates, but having from the outset its own distinct aims.* Useful as were the lectures, the art classes, and the growing museum of architectural examples thus provided, it cannot be said that, in its official capacity, the Council of the R.I.B.A. was able to do much for education.

*Those who thought of architecture as one of the "fine arts" sometimes took up the position that none of these things even came within the scope of the architect's duties. "It is imperative," wrote Mr. T. G. (afterward Sir Thomas) Jackson in 1892, "that the callings of the architect and surveyor should be kept distinct; and that the architect should *give his whole life to his art*, leaving to the lawyer, the surveyor and the commission agent those incongruous, though lucrative, occupations to which so many nominal architects, within the Institute and without, devote the larger part of their time." ("Architecture a Profession or an Art," edited by R. Norman Shaw and T. G. Jackson, 1892, p. xxix). But this was in the heat of controversy. A no less distinguished member of the profession gives us, seven years later, a saner view of the duties of even the most artistic architecture. "He must be an artist in the first place, for without the intuitions of an artist he can never hope to be a really great architect. He should be a man of science in the second place, that he may wisely select and apply the materials at his command. He should be a man of business in the third place, with a sense of the value of money, a knowledge of the cost of materials and labor, and of how to dispose of the sums intrusted to his spending." ("Architects," by Alfred Waterhouse, in "Unwritten Laws and Ideals," by Miss E. H. Pitcairn, 1899, p. 342.)

*The Architectural Association, from its establishment in 1847, always a separate body, with its own membership and funds, is now more closely than ever associated with the Institute, of which it has come to be recognized as the educational branch. Its president for the time being sits *ex officio* on the Council of the Institute, and it now nominates officially an Advisory member to the Institute's Board of Architectural Education.

It has some 1500 members (of whom a third are either Fellows or Associates R.I.B.A.), at an annual subscription of a guinea (or 1/6 for provincial members of the allied societies); and it administered its own very successful Day and Evening Schools of Architecture until 1916, at Tufton St., Westminster.

(*To be continued*)

Antique America

By MARK DANIELS

In all Cliff Dwellings of Any Extent There Have Been Found Kivas, or Ceremonial Chambers, and the Removal of the Debris of These Ruins Would no Doubt Disclose Such Remains.

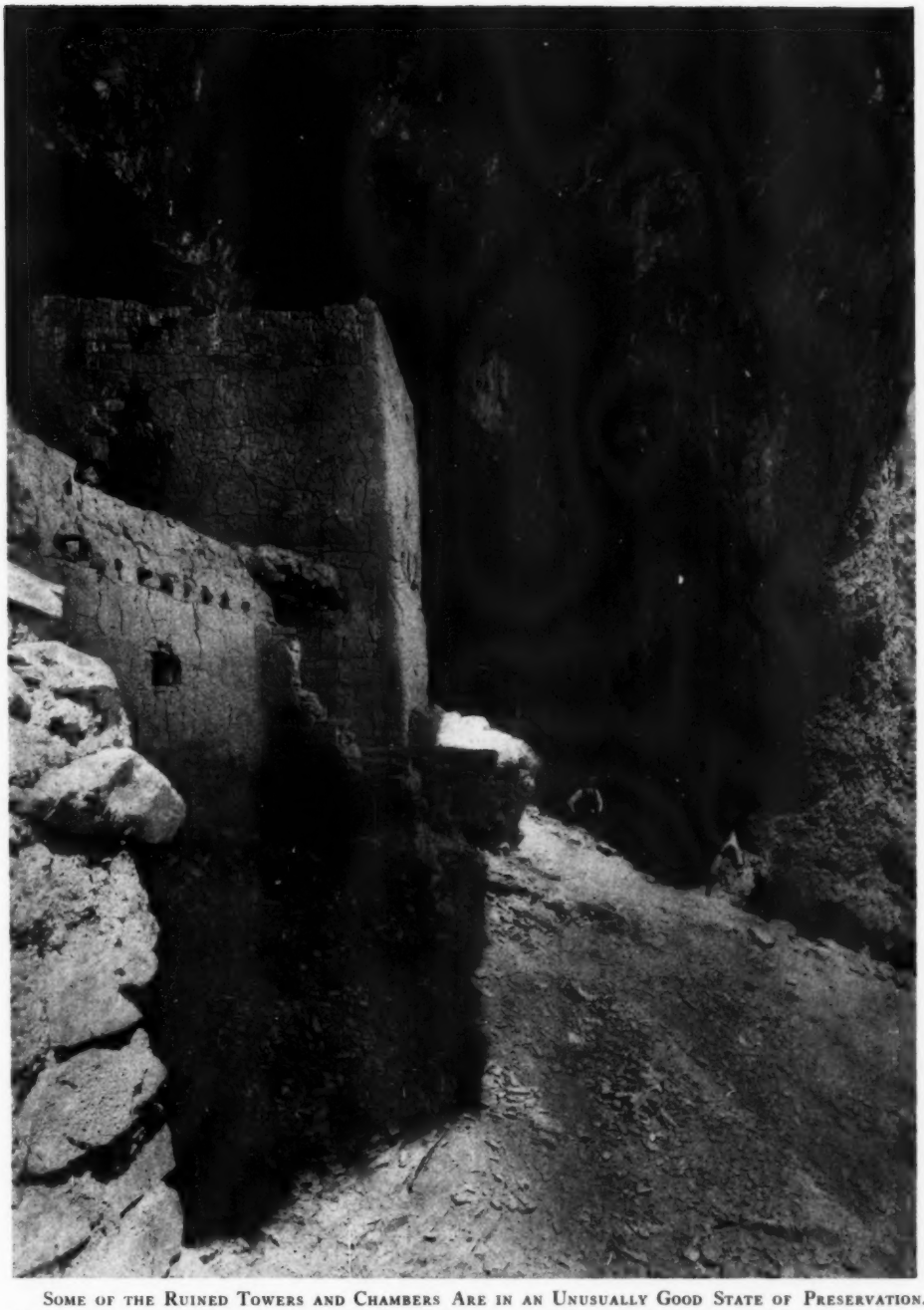
A PROPHET is not without honor, save in his own country. Witness the fact that annually millions of dollars are spent by American tourists who ignore the ruins of an ancient race in the southwestern part of the United States and spend their money on another continent. Perhaps they are prompted to do so by the weakening admonitions of a conscience which urges the expenditure of some of their surplus funds in the country whence most of it came. However, it hardly seems possible that such a flimsy excuse could justify the citizens of the United States in turning their backs upon the glories of Apache land where the ruined cities of a once populous race extend, in joint appeal with the glories of this land of color, and the lure of its fascinating mysteries to the lover of antiquity.

It seems strange that in this day of perpetual "Open Season" on railroads, when the big-game hunters of Washington take particular delight in pot-hunting the common carriers, it is left to a railroad to open the way and demonstrate to the people of the United States that the wonders of the scenery and history in the Federal Reservations in the southwestern part of the United States need not be strangers to the feet of white men. Yet this is at present

CLOSE VIEW OF A RUIN NEAR ROOSEVELT DAM, ARIZONA. The walls are of stone laid up in adobe mortar; some were plastered. The floor construction is of small, straight wands laid on cross-beams. Above these is placed the floor of stone and adobe. A man in the rear chamber may be seen through the hole in the wall.

the case, for only within the past year has the Southern Pacific Railroad sent an expedition into the Sierra Ancha Mountains of Arizona and discovered numerous ruins of the cliff dwellers, in great caverns, high up in the precipitous walls of cañons that seem, when viewed from the top, to extend to the very bowels of the earth. No doubt most of these ruins have been seen by white men before, but there is also little doubt that some of them have not. In any case, the number of white men that have been there could almost be counted on the fingers of the hand.

The ruins of this district, exclusive of that monumental ruin which our beneficent Government has made of the Apache Indian, are not confined to the type known as cliff dwellings. There are remains of the work of the mound-builders and some walls and buildings left by either the Taltecs or Aztecs who built their cities on the plains. To enumerate and describe the different varieties would take a volume or so, as is evidenced by the reports of the Smithsonian Institute on the subject of ruins in the Southwest. Many of them are quite inaccessible and therefore, as yet, of little interest to the traveler. But there are some very close to the automobile road which traverses what is known as the Apache Trail, and these may be seen with little effort. There are two groups of small dwellings within a mile or two from the Lodge at Roosevelt Dam, which can be easily reached afoot or horseback. Neither of these ruins has been cleaned of the debris that clutters the bases of the standing walls, and therefore they do not present as extensive a plan as would be seen if they were cleared and restored. Nevertheless, they are of sufficient interest to



Some of the Ruined Towers and Chambers Are in an Unusually Good State of Preservation. The desiccating atmosphere of Arizona preserves matter so that there is substantially no decay. Woodwork, corn, and other household articles may be found in good condition after a lapse of nearly a thousand years.

It is Very Difficult to Secure a Good Picture of the Interior of the Ruins, as Few of the Rooms Had Any Source of Light. This illustration clearly shows the roof and floor construction.

any lover of antiquity to justify a trip over the Apache Trail.

Much has been said and printed about the Apache Trail, but little or nothing has been reported about the ruins that can be seen in the vicinity, and so a party was gathered together to investigate this question and ascertain how extensive were the ruins in the neighborhood of Roosevelt Lake. The party started from Phoenix, Arizona, by motor, and traversed the road from Phoenix to Roosevelt, keeping alongside of the old trail which was used by the Indians in crossing from one range to another. Here and there, along the road, glimpses of the trail could be seen, worn deep in the attesting stone by the moccasined feet of the Indians. Cañons and cliffs were on every side, and to one who was familiar with the sites which had appealed to cliff dwellers in other parts of the world, it was at once evident that somewhere in this country of mesas and box cañons there must be a great number of ruins. At one point can be seen, through a gap, the scene of the last stand of the Apaches before our conquering soldiers, and as the party ventured further into the mountains, the spell of antiquity enfolded all with the mantle of respectful silence.

Upon turning the point that overlooks the Roosevelt Dam, the atmosphere suddenly changes, for, stretched out before the traveler is a great valley filled with a beautiful lake, at the sight of which, and as the spell was broken, the party on this particular trip began chattering like a flock of magpies. After a night's rest at the Lodge, the serious work of trying to find the great number of ruins which rumor, in Phoenix, had located as being a few miles from Roosevelt Dam, was begun. Everyone knew, of course, that there were ruins of cliff dwellings in the Cherry Creek Cañon, Pueblo Cañon, Devil's Chasm and Whatnot, but no one had ever seen them or had been there before. Everyone knew somebody else who had, and all that was necessary was to ensconce oneself securely on the hurricane deck of a bronco and ride to them. So horses were ordered to meet the party on the north shore of the lake, to reach which place it is necessary to ferry the eastern arm. The only difficult part of this task was in getting the ferry to go across the lake. All other details were easily managed. Horses were driven on board the ferry with no mishaps, while the boat also was finally launched and got well under way, and, so far as could be determined with a naked eye, the engine was running beautifully despite its decrepitude. Members of the party, not knowing the engine, thought that all was well, but the man who had nurtured it from childhood and trained it with a vocabulary that would make a sea captain turn green with envy, knew better. Suddenly he decided that the engine's good behavior was due entirely to a preconceived plan to lull his suspicions until the pyschological moment might arrive. The engineer therefore took steps to anticipate any refractory inclinations on the part of the engine and began pouring things into it. He poured water into a pipe and oil into every hole on the engine. As a result, we were stranded mid-stream. The only consolation in this situation was the fact that there were horses aboard that could be eaten if no assistance arrived. After several hours of delay, however, the sulking mood of the engine ceased, and the boat was finally landed on the northern shore. From this point on, evidences of the lack of veracity on the part of the residents in Phoenix sprang up with shocking rapidity.

First, the road which had been pronounced almost impassable was found to be an excellent highway over which an automible would have had little difficulty in traveling at a fair rate of speed, and the temper of everyone can be imagined when it is realized that they were confronted by an all-day horseback ride over a road that could be traversed by a motor in a few hours. At the summit, however, the ride was fully rewarded by a sunset which would have been missed had a motor been used.

Off to the west from the great Roosevelt Lake, the sun was setting in a sea of red and purple fire. The vertical walls of the cañons that threaded the mesas were cast in silhouette, here and there, against the vivid skies. Violet shadows were shot with shafts of orange and scarlet. Far to the south and the north, the colors of the sky faded from orange and yellow to a pale luminous lavender. But it is hardly safe to describe a sunset in this district. No one would believe it. It is even difficult to believe while observing.

The party reached a place known as Carr's Ranch about 8.30 in the evening, having traveled the last two hours in darkness that would

ONE OF THE RUINS NEAR ROOSEVELT DAM, ARIZONA. The debris has never been cleared away from the bases of the walls. No kivas, or ceremonial chambers, are in evidence, but would undoubtedly be found if the ruin were cleared.

defy comparison with a coal-mine. At last it seemed certain that all information desired would be easily secured from Old Dad Carr; and these hopes were fully justified when that dignitary informed the party that he could take them to a dozen ruins if they were crazy enough to want to see the silly things. As a result, the next morning every member was seen breaking a half-inch of ice to get to the water in the bottom of the wash-basin.

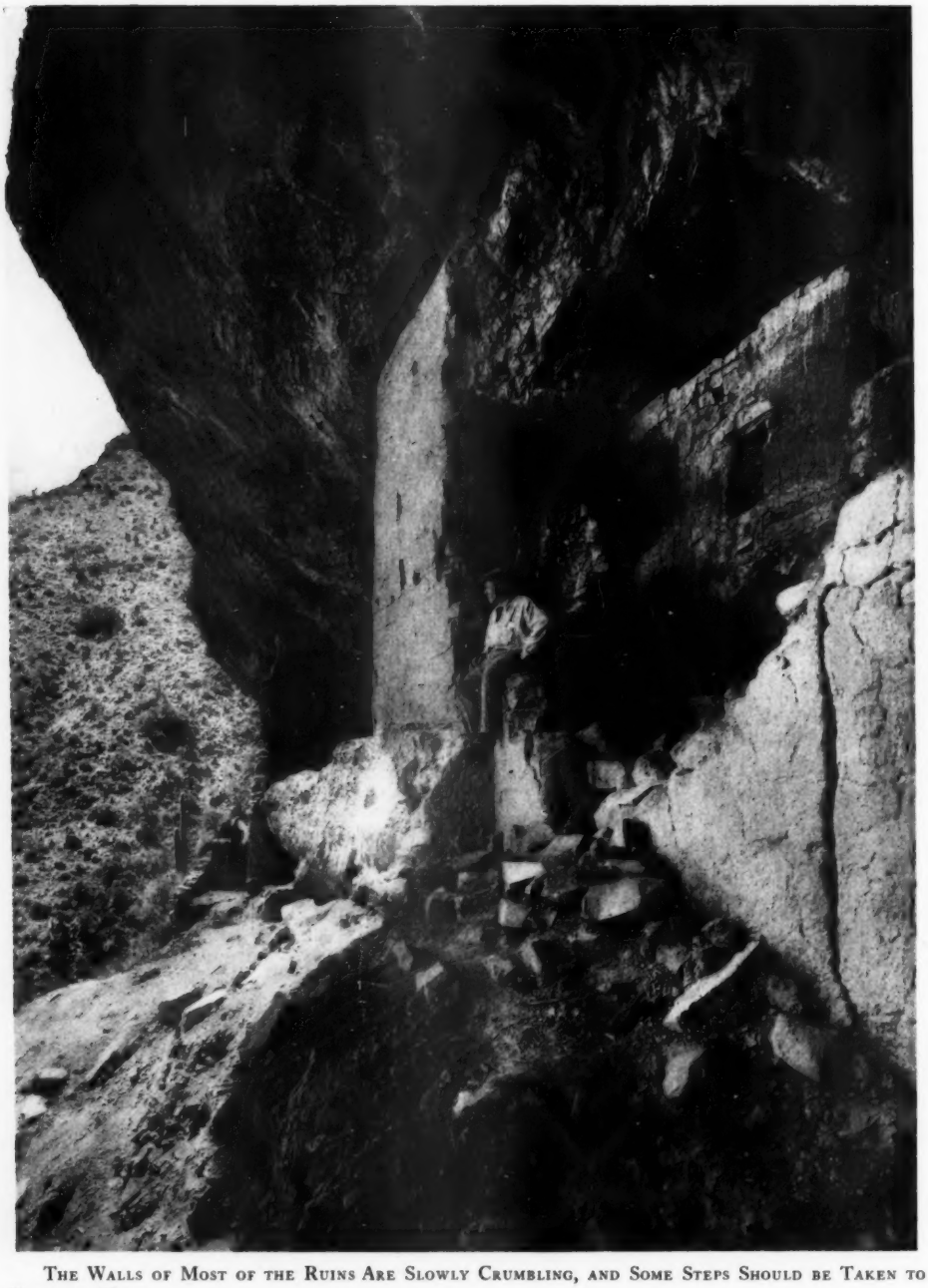
By 7 o'clock the mountain road was abandoned for a trail through one of the chasms, and by noon the main summit of the mountains had been reached. Here the party was led by Old Dad Carr to a point known as Look Out, for Arizona firmly refuses to acknowledge the distinction of not having a "Look Out" point in every range of mountains, as have all other states. After lunch the sweeping panorama of the Cherry Creek Valley and the White Mountains in the distance were pointed out to a gasping audience. After they caught their breath some of the party began timidly to inquire about the cliff dwellings, and the trail was again taken up.

About 3 o'clock, Carr, who was leading the company with a man who swore he had let himself down to the ruins by a rope, led the way out on the rim of Devil's Chasm, which feeds the great Cherry Creek Cañon. Everyone was asked if they had ever seen such a chasm before, and, in justice to their truthfulness, each admitted that he had not, though all had traveled considerably. But where were the ruins of the cliff dwellings? Dad Carr spoke up:

"Gosh ding it! I never thought you men wuz serious about them there cliff dwellings. This scenery here is a whole lot finer. I wisht I had known you really wanted to see the pesky things, but we h'ain't got any time now because we'd freeze plum to death before midnight here." And so the party returned, to send another expedition out to find the ruins.

A party did finally go out to find those ruins. They went where instructed and ignored the advice of the hundreds of people who had climbed into ruins and through them and let themselves over cliffs to them, yet who could not find a trail that went within twenty miles of them. They actually found them and at the same time were unable to discover any indications of white men ever having been in any one of those ruins. Many of them were high up in great cliffs and so inaccessible that they could be seen, in any degree of detail, only with the binoculars. Several of them were actually visited. As a result, another party is going, fully equipped with cameras, artists and laborers, to actually reach the bigger cañons and to bring back evidences, on an extensive scale, of these wonderful and fascinating remains of a lost race. The Southern Pacific Railroad Company also will open up trails this year; a comparatively small expenditure of money will bring these places within a few hours by motor from Roosevelt.

A Scene in the Box Canyon of the Road Along the Apache Trail Taken at a Point About Fifteen Miles from Roosevelt Dam. After a painting by C. K. Bonestell, Jr.



THE WALLS OF MOST OF THE RUINS ARE SLOWLY CRUMBLING, AND SOME STEPS SHOULD BE TAKEN TO PRESERVE THEM.

The Architecture and Incidents of a Texas Frontier Town

By SAMUEL E. GIDEON
Associate Professor of Architecture in The University of Texas
With photographs by the author

The Feathery Green of the Mesquite with a Background of Deep-Toned Stone Work

HAVE you ever lived within less than a hundred miles of a place whose identity you never knew, and then come upon it unexpectedly and discovered a town—in this case—of unusual charm and interest? You wonder why its houses of such artistic merit have not been heralded by its people and by outsiders who did know of their existence. This was my experience, on a recent pearl-hunting trip, when we stopped in the little town of Mason, in the great big state of Texas, to buy gasoline for the car.

Mason, a very old town, on the old overland road from San Antonio to El Paso, is way off the railroad—thirty miles off in fact—in the heart of a great cattle country, where the climate is ideal, the skies clear blue, the hills low, the shrubs and trees stubby, with the exception of the live-oak and pecan, and the cattle and people huge.

As Texas was settled in the early days, chains of forts, in charge of United States troops, were established on the frontier for protection against the Indians, who, once friendly, became hostile.

Fort Mason was built in 1852 on a hill overlooking the country for miles around—the rendezvous of the Comanche Indians—and at its foot sprang up the little town of Mason, settled by the pioneers who clustered around it for protection and who were often given employment in the fort.

The fort consisted of officers' quarters, a mess, and barracks, all substantial stone houses, surrounded by a high, thick stone wall. Hardly a trace of this fort now remains, save a well and a few piles of stone. It is told that the stones of the fort were plundered to build the foundations of many of the houses in the town.

At the foot of the hill a beautiful spring, now capped by a cement fountain for the use of the children in an adjoining school, was an attraction for many army officers who traveled from fort to fort in this vast stretch of country. Gen. Robert E. Lee, who was then inspector general of this chain of forts before the out-

From Across the Rolling Country One Can Identify the Location of a Residence by the Lombardy Poplars in Its Garden. Usually There Are Two, and They Are Taller and Healthier Than the One in This Picture

A Type of House Introduced by the German Settlers. A Frame of Post-Oak Timbers Doweled Together with Wooden Pins, with the Spaces Between Timbers Filled in with Rocks

Log Houses Are Common. The Chinks Between the Logs Are Filled with Rocks, Chunks of Wood and Mud

This House with Its Traces of Brilliant Color and Lichen-Covered Roof Has all the Charm of a Foreign House

break of the Civil War, spent much time at Fort Mason and was much attracted to this spot.

In what is now the town of Mason, John O. Meusebach, representing the German Emigration Society in Texas in 1846, signed a treaty with the Comanche Indians, under a live-oak whose twisted, gnarled, and decayed trunk still stands. Meusebach was greatly respected by the Indians, who called him "El Sol Colorado" (The Red Sun) on account of his flowing red beard. This district was part of the grant of the republic of Texas to Fischer and Miller for colonization purposes. Each head of a family was to receive 640 acres and each single man 320 acres.

Fischer and Miller sold their rights to The Adelsverein in Germany, an organization of noblemen for German immigration purposes on a large scale. The grant was a long and dangerous way from the coast, the place of landing. The Germans, in the meantime, settled at New Braunfels and Fredericksburg, and not until assurances of friendship were secured from the Indians was an attempt at colonization made in the grant.

The first houses were picket houses built of post-oak logs stuck upright in the ground.

The Complex System of a Prosperous Settler's Home

"Hall-Way Houses."—Two Houses Were Connected by the Same Roof, Which Formed an Open Hall-Way, Now Closed in

Later there was the hallway log house, built in stages—first as a single cabin, then the cabin was duplicated and the two connected by one roof, leaving a hallway in the center. When the Germans came, they built their typical German house, called the *Fach haus*, which is a half-timber structure whose post-oak frame of uprights and diagonal braces is first put up and doweled together and the spaces filled in with rocks. Brown sandstone, which is plentiful in this locality, became the common building material. The stone is of an excellent quality, but much of it contains iron which enriches the color but is difficult to work. The walls of houses and the fences are laid up in rubble, "random rubble" and "range work," and sometimes all these methods are combined in one building.

There are many thrifty German families here, people who came, or whose parents came, from troublous Germany of the eighteen forties under the auspices of the German Emigration Society. Chief among them is a most remarkable woman who came over with her family after her father failed in business. They were people of education, means, and refinement and

The Natives Wonder Why One Sees Beauty in These Old Rock Walls over Which the Feathery Mesquite and the Live Oak Trees Drape Themselves so Beautifully

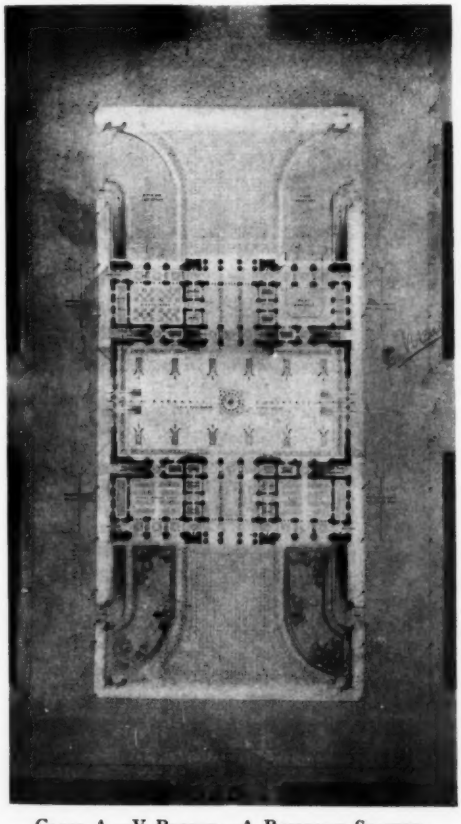
This House Was Quite Small at First and Grew as the Settler's Means and Family Grew

Barns, and Even Houses, Partly of Stone and Partly of Logs, Are Common

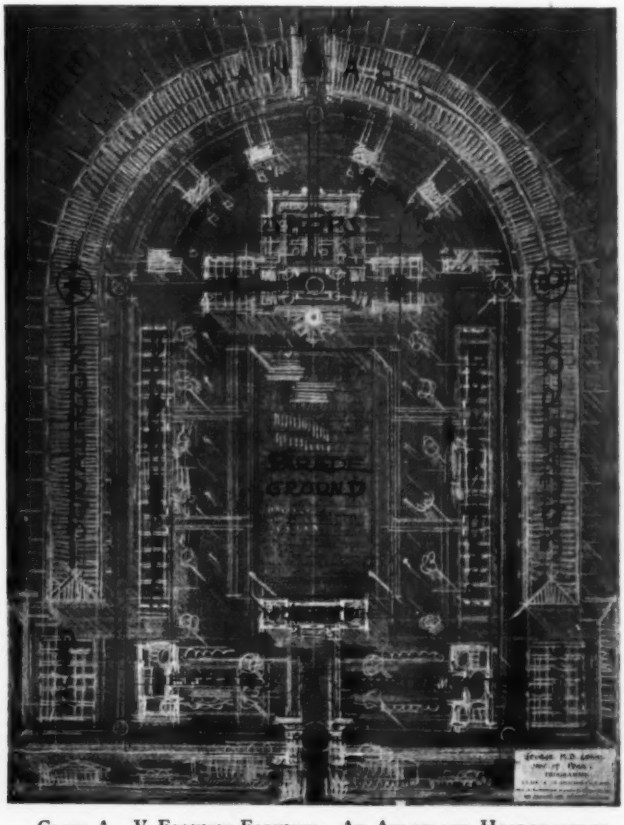
found life in this country, from the moment they landed, full of trouble and misfortune. The Immigration Society promised them much and they found nothing, and after weeks and weeks of travel with an ox-team they were dumped in the midst of a wild country infested with Indians.

Mason is the shopping place, not stopping place, for a band of pearl hunters, who spend eight months of the year combing the rivers in the neighborhood for pearls and the remainder of the year mending stoves. They never live in houses, but the year round they are either in the water or in their prairie schooner, which is usually drawn by two donkeys and followed by a procession of scrawny dogs. They know the value of a pearl, but realize that they cannot demand the price, and dispose of most of their finds to a local banker and ranchman who now has a large and beautiful collection. Others they trade in to a local grocer who sends them on to the East.

And so the present-day life of this little town goes on day after day, the automobile and good roads putting it more and more in touch with the outside world; but the old houses of the early setters are fast going to decay. Therefore it will not be long before these interesting walls and fences will be only a memory, no more than a pile of stones like those in the ruins of the fort.



CLASS A.—V PROJET.—A RAILROAD STATION
First Medal, L. Suckert



CLASS A.—V ESQUISSE-ESQUISSE.—AN AEROPLANE HEADQUARTERS
Third Medal, G. M. D. Lewis

BEAUX-ARTS INSTITUTE OF DESIGN

Beaux-Arts Institute of Design

Official Notification of Awards—Judgment of May 8, 1917

Class "A," Fifth Projet

Jury of Award.—F. H. Bosworth, Jr., W. Emerson, L. Warren, F. C. Hirons, H. R. Sedgwick, H. W. Corbett, J. Wynkoop, W. P. Barney, G. A. Licht, H. L. Shay, E. V. Meeks, F. R. King, H. Tallant, B. W. Morris.

Program.—A Railroad Station. Drawings submitted, 49.

Awards.—First Medal, L. Suckert, University of Pennsylvania.

Second Medal, B. Cardwell, Carnegie Institute of Technology; P. H. Harbach, Cornell University; L. C. Licht, University of Pennsylvania.

Class "A," Fifth Esquisse-Esquisse
Class "B," Fifth Esquisse-Esquisse

Jury of Award.—F. A. Godley, J. O. Post, G. H. Bickley, B. Delehanty, F. H. Haskell. This Jury also served as Jury of Award for Classes "A" and "B" Archæology, Fifth Projets and Measured Drawings.

Program.—Class "A," An Aëroplane Headquarters. *Drawings, 14.*
Class "B," A Sign-Post. *Drawings, 57.*

Awards.—Class "A," Third Medal, G. M. D. Lewis, University of Pennsylvania.

Mentions, L. C. Licht, F. A. Chapman and B. E. Howden, University of Pennsylvania.

Class "B," First Mention, F. J. Tarlowski, Syracuse University.

Mentions, P. A. Tischler, Columbia University; W. B. Grove, Carnegie Institute of Technology; F. Monhof, Los Angeles Architectural Club; F. M. Hodgdon and A. G. Mayger, Atelier Rebori, Chicago; R.P. Vanderpoel, Syracuse University; J. F. Cook, Atelier Wynkoop, New York City.

Class "A" and "B" Archæology, Fifth Projet

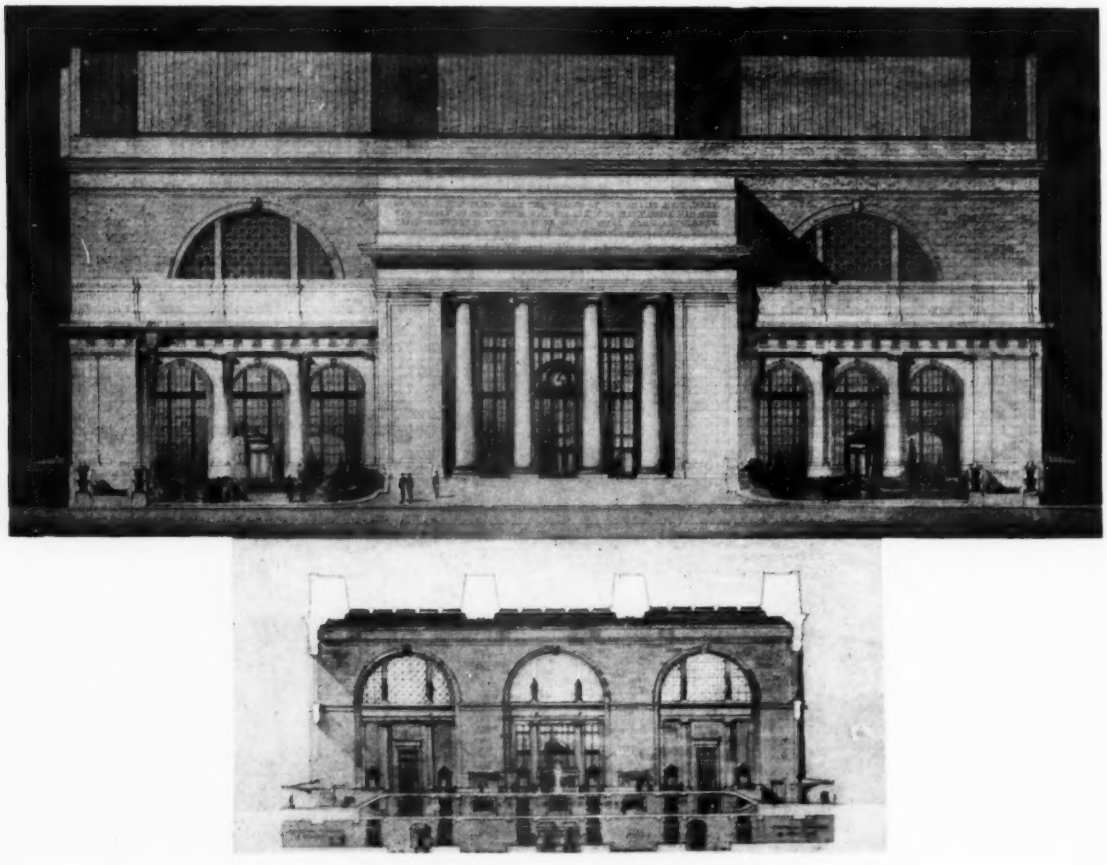
Program.—A Garden Bathing-Pool. *Drawings submitted, 5.*

Awards.—Mentions, P. O. Klingensmith, L. C. Smith and M. E. Boyer, Jr., Carnegie Institute of Technology.

Five Measured Drawings were submitted in this competition on which the following awards were made:

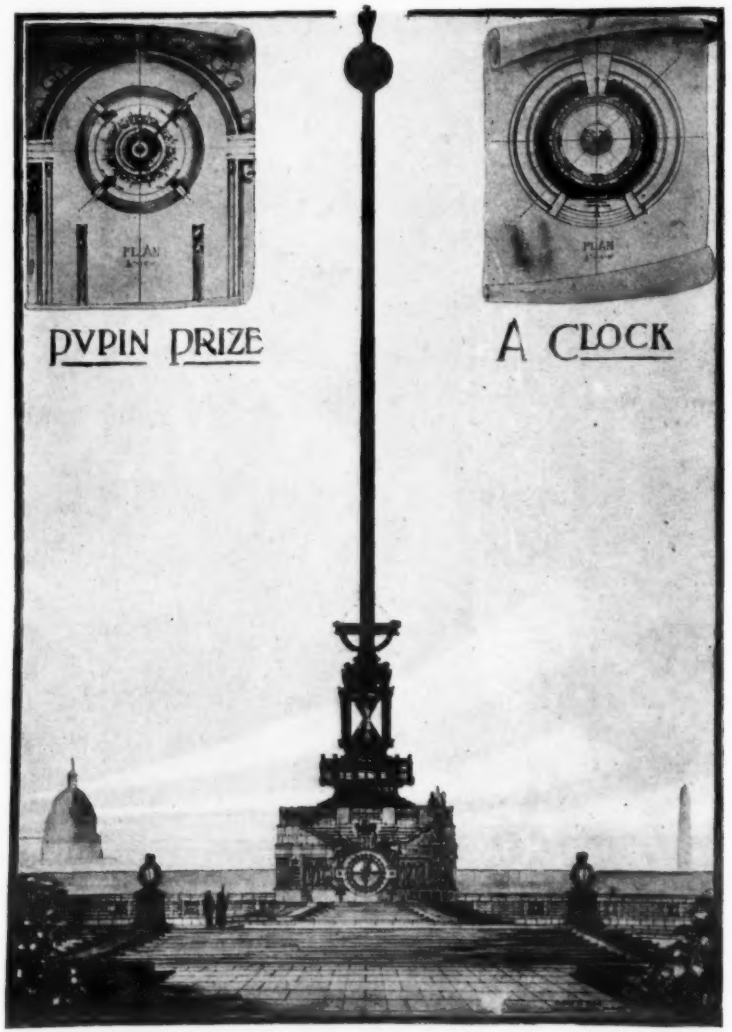
Third Medals, L. C. Smith, Carnegie Institute of Technology; W. J. Creighton and G. M. D. Lewis, University of Pennsylvania.

Mentions, W. R. Kendall, Carnegie Institute of Technology; V. Balikdjian, Syracuse University.



CLASS A.—V PROJET.—A RAILROAD STATION
First Medal, L. Suckert

PUPIN PRIZE COMPETITION.—A CLOCK
Second Prize, G. M. D. Lewis



PUPIN PRIZE COMPETITION.—A CLOCK
First Prize, R. W. Hubel

THE CATHEDRAL OF SAINT ANDRE AT BORDEAUX

The Cathedral of Saint André at Bordeaux

By JEAN-PAUL ALAUX

ONE of the most admired monuments of Bordeaux is certainly this cathedral, its two spires seeming to challenge the heavens with their audacious tips, and its isolated tower crowned with a bronze Virgin and named the Tower of Pey-Berland, after one of the early archbishops. We cannot more successfully give an idea of this majestic ensemble than by offering one of the beautiful pen-drawings of Léo Drouyn, who was a master of engraving, and whose archeological work at Bordeaux and in the adjacent region was very extensive.

Fifty years ago the Cathedral still possessed the same setting as in the Middle Ages. Like most Gothic churches, it was surrounded by little, narrow, winding streets, and houses were braced against the very walls of its nave in most picturesque disorder. So was it also, as Victor Hugo relates, with Notre Dame de Paris, whose main façade alone projected itself into the Place. Plans were made to disencumber the Cathedral and, at the same time, the town hall, whose mass may be seen in profile on the right of the engraving, at the end of the Place. The Cathedral presents to the city its lateral façade adorned with the two spires above the principal porch, on the right of which is seen, slightly in the background, the Porte Royale. This is due to the fact that the façade opposite the choir at the end of the great nave was backed against the ramparts of the city. That façade is, therefore, but a bare wall devoid of all interest.

The great nave is the oldest portion; there we find architectural remains, of the beginning of the twelfth century. The arches which had crumbled were rebuilt. But the number of bays was doubled by adding a story of windows.

At that period the archbishop of Bordeaux was made pope, under the name of Clement V; he directed the work on the apse about the year 1300. The importance of this portion may be seen by the accompanying plan. The great nave, which is perhaps the largest of its epoch (it measures 18 metres), has arches lower by 6 metres than those of the choir (29 metres and 23 metres). That gives a magnificent amplitude to the choir, which is narrower but whose perspective is increased by the number of chapels radiating from the ambulatory. In 1508 "a contract was made with a mason to lower the arches." The moldings of these arches show in their intelligent geometric design the style of the sixteenth century.

Among the parts of the church which attract special attention are the three doors, two on the north side and one on the south. The Porte Royale, on the north, is a pleasing piece of sculpture of the time of Saint Louis. This door, once hidden by a wall of masonry, was only disclosed within a few years. Several statues from the gallery above it, whose trilobate arcades are supported on slender little columns, have been reproduced by Viollet le Duc for Notre Dame de Paris. Its lintel displays a Resurrection of the Dead, curiously naïf in conception. Above on the tympanum appears a Last Judgment. What an exquisite mysticism in this Gothic work! Christ is shown seated on His throne, around Him winged figures

bearing the symbols of the Passion. The cross shines apparently with such brilliancy that angels are carrying away the sun and moon, which have *become useless*.

The other north door, which serves as the principal entrance, under the great rose-window between the towers, is truly a *chef d'oeuvre*. Casts of it have been made for the Museum of the Trocadero, the South Kensington Museum, and the Carnegie Institute of Pittsburgh. The personages whose effigies adorn the jambs of the door are probably bishops or cardinals of Bordeaux created by Pope Clement V, who himself appears on the pillar in the center of the porch.

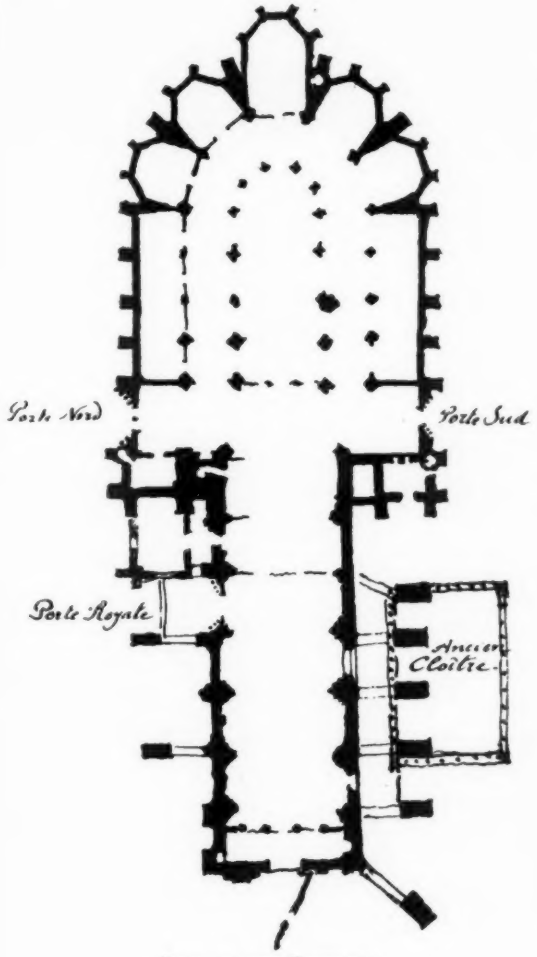
The façade is crowned by two slender spires whose outline is, perhaps, a trifle attenuated, but which give to the edifice, lofty in itself, an effect of extreme height. It is unquestionable that this façade has, as they say at the Beaux Arts, "*beaucoup d'échelle*."

The south porch at the extremity of the transept is very pure work of the thirteenth century. The frieze which decorates it, at the height of a man's head, is extremely beautiful; but the bas-reliefs, unfortunately, were mutilated during the Revolution. We offer a reproduction of this porch from an *aqua fortis* by Drouyn.

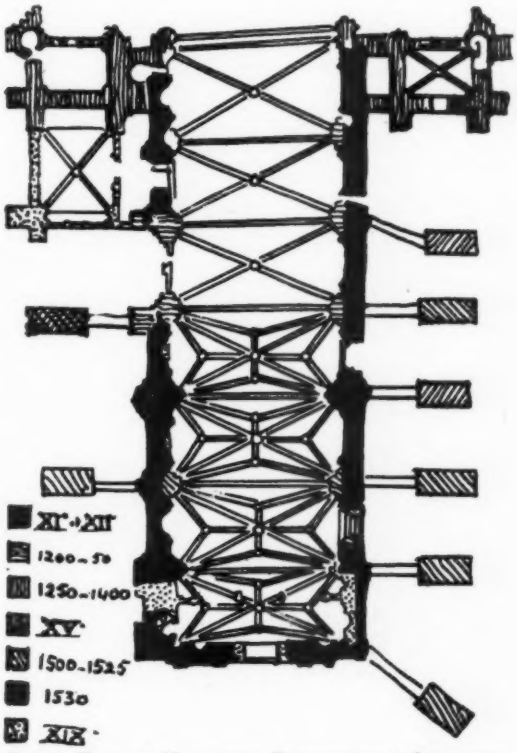
In the interior of the church is found a Crucifixion by Jordaens, a masterly work. The crucified Christ is represented—as according to the Jansenist belief—with the arms stretched vertically toward heaven. Several tombs of cardinals and bishops built against the walls of the great nave are interesting examples of modern sculpture. Unhappily, all the ancient mausoleums, some of which, according to the chronicles, were very fine, were destroyed in 1793. The pulpit, wrought in the eighteenth century by the great sculptor Cabirol, was ordered for the church of St. Rémy. The Revolution ordered it transported to the "Temple Décadaire" of St. Michel, where the worship of Reason was observed. In 1804 this pulpit was given over by the church of St. Michel to the Cathedral where we now see it. It is a delicate and admirable piece of execution of very fine style.

On the south side of the Cathedral was formerly a cloister composed of open work arcades. The architect Abadie, designer of the Sacré Coeur of Montmartre, tore down that cloister to make room for the sacristies.

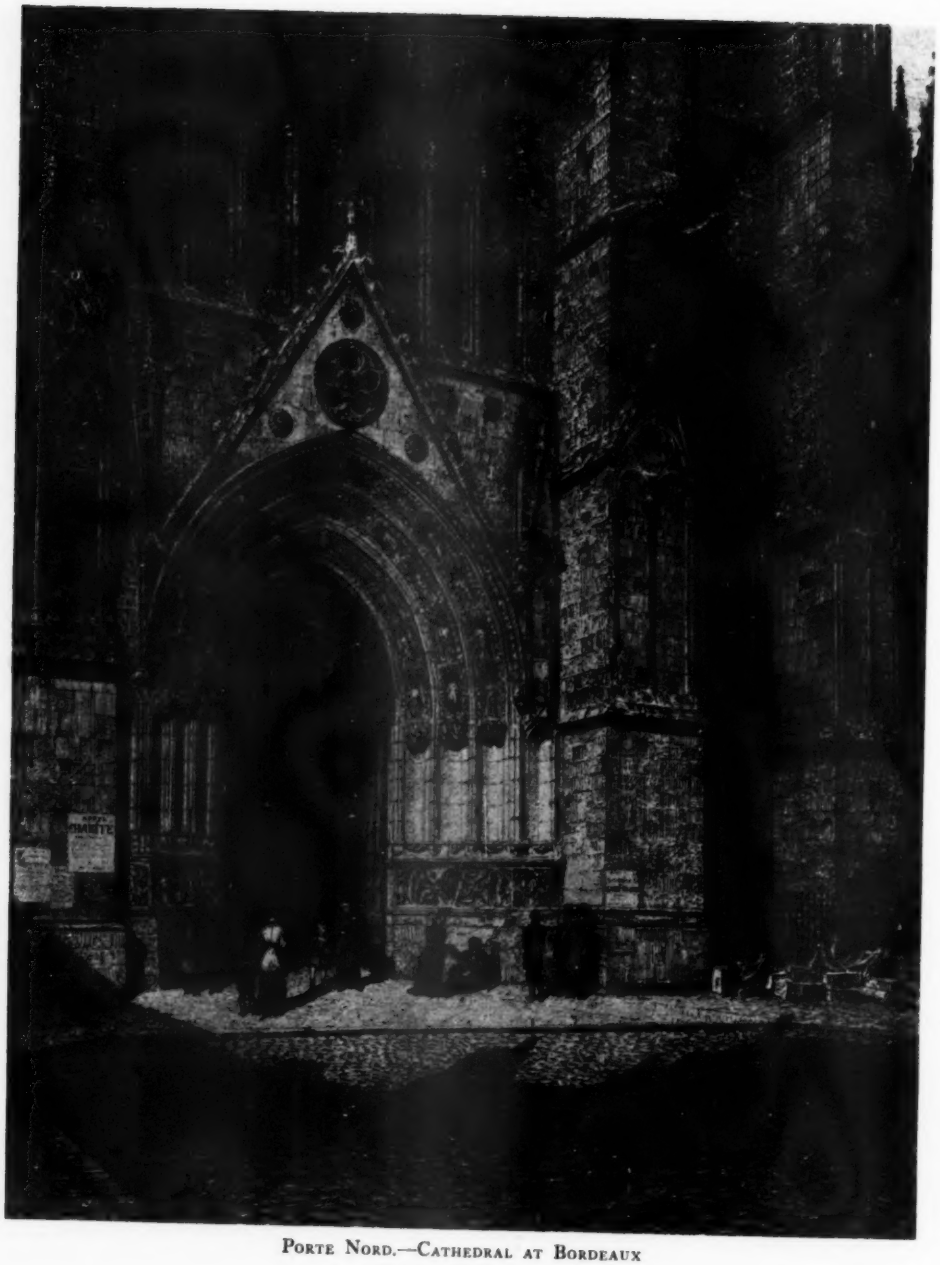
The Tour Pey-Berland, which forms a part of this ensemble, is nevertheless a completely isolated tower. Its construction was decided on by the Archbishop of Pey-Berland, who began the work in 1440. Hurricanes over-



Plan of the Cathedral



Detail Plan of Nave with Chronological Indication

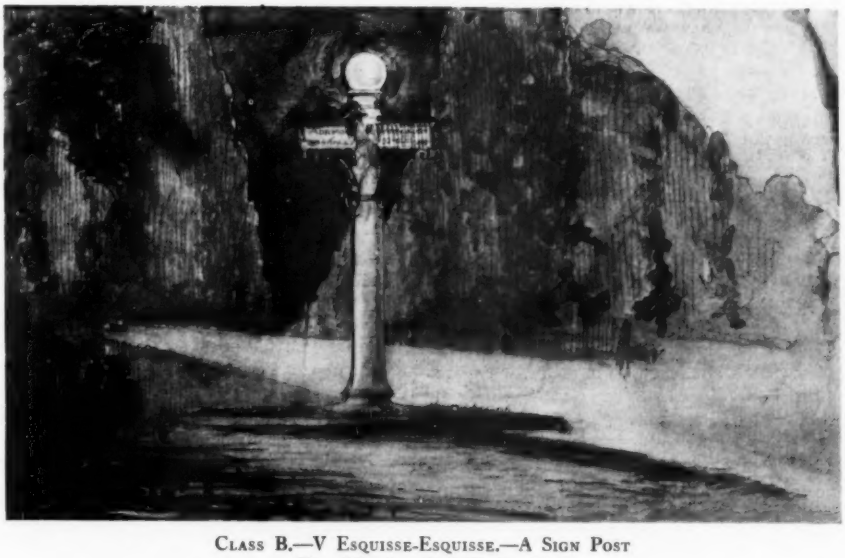


PORTE NORD.—CATHEDRAL AT BORDEAUX

threw its spire. Another hurricane, yet more dangerous, afterward threatened it—the Revolutionary hurricane. The Tower was, in fact, sold on the 23d of April, 1793—"the purchaser being enjoined to demolish the aforesaid tower of Pey-Berland within three weeks' time." Luckily they found a use for the structure, which became, like the Tour St. Jacques at Paris, a shot manufactory. In 1850, Cardinal Dounet bought it back and crowned it with the bronze virgin which adorns its summit today.

Visitor to Bordeaux, mount to the top of the Tour Pey-Berland; you will see a magnificent panorama! The fair city stretches indolently along the bank of its broad river. Above the sea of its roofs, whose waves are lost in the blue distance, rise like great ships the bold monuments of the ancient capital of Aquitania.

[NOTE.—Many months have elapsed since Monsieur Alaux's last contribution to the Journal, and the letter which accompanied the article above will be of interest at the present moment. "I am writing you in the middle of the night," says Monsieur Alaux, "from the powder works where I am serving. My hours are from 7 o'clock in the evening until 7 o'clock the next morning. It is hard work! But what would not one do for France! Here, we salute the entrance of the United States into the war with ardent joy. The Stars and Stripes have already floated above the battlefield of Vimy, reconquered by the Canadians. Quel symbole! The success at Vimy, Lievin and at Angres, is especially dear to me because I passed more than a year in the trenches before those points which we could not attain, lacking sufficiently powerful artillery, in spite of unremitting effort. From my trench I saw the houses of Lievin as plainly as one sees Brooklyn from the end of Manhattan Island. The first American soldier to debark in France will be received like a god! Many of them are now in the aviation service, and I shook hands with Norman Prince, in the train from Bordeaux to Paris, a few days before his death on the Somme front.



CLASS B.—V ESQUISSE-ESQUISSE.—A SIGN POST
First Mention, F. J. Tarlowski

BEAUX-ARTS INSTITUTE OF DESIGN. (See page 290)

Book Reviews

Lombard Architecture. By Arthur Kingsley Porter. New Haven: Yale University Press. London: Humphrey Milford, Oxford University Press, 1917. Three volumes text, one volume plates. 750 copies printed from type. $50.

An adequate review of Arthur Kingsley Porter's "Lombard Architecture" is a task for the archæologist rather than the architect; it is an archæological work, a synthetic analysis of the style, as the author himself terms it, not a history—not a history, because that word connotes a treatment of the theme that shall place it in relation to the human scene, make it a part of the human story. In such an analysis the qualities that make Symonds' "History of the Renaissance in Italy" more interesting than a tale are, perhaps inevitably, missing; in the latter the works of the chosen period are so bathed in the atmosphere of the time, the work of art so surrounded with warm living presences, that it lives again for us with them. True that the salient personalities of the Renaissance lend a strong human interest to the art of the time; true, that in the darker centuries from the sixth to the twelfth the individual is merged in the mass; but the mass did live and breathe; the period, century by dim century, had an atmosphere of its own; and this atmosphere is almost completely absent in the work under review. The monks of Cluny, the Cistercians, the bands of workmen moving from place to place with the master builder, the squabbles between the communes and the church—these are touched upon in the introduction to the first volume, the only part of the book the architect will read with any great degree of pleasure; but the summary manner in which they are treated, the rather dry touch, make one feel that the author was not particularly interested in them but was anxious to pass on to the analysis and comparisons of vaults and capitals, corbel tables and the like which occupy the body of this volume, and the detailed descriptions of buildings, a sort of *catalogue raisonné*, forming, in small print, the second and third volumes.

The plan adopted for the illustrations is most unfortunate. They are half-tones on a highly calendered paper and contained, loose, in a box, with an index. Each plate carries from one to half-a-dozen subjects; each subject is merely numbered, and to identify any one, when going through them, reference to the index is necessary. To get at the illustrations at all, they all have to be taken out of the box and the paper is so slippery that handling them bores one to tears. In a conscientious effort to study the book seriously for review, the physical difficulty of referring to the illustrations was so vexatious that I found myself repeatedly shrinking from looking them up. Why they were not bound instead of left loose, why the titles of the subjects were not printed along with the identifying numerals, is incomprehensible. The paper of all the volume is excellent, the type beautiful, the page of the first volume handsome and most legible, the binding simple but adequate. The arrangement of the illustrations could not have proceeded from motives of economy; but it is a serious error in a book of reference such as this.

The reader cannot fail to be deeply impressed by the stupendous amount of research, the immense patience in examination and comparison, the scholarship, the acumen, penetration, involved in the production of these volumes. And in the presence of such a monumental work, the fruit of such sincere and painstaking labor, a labor that must have been carried through with a sustained passion, it seems ungracious to have to say that the book leaves the reviewer quite cold; the passion is to be divined and ascribed by the reader; it is not communicated to him. But to the archæologist and the special student the book will no doubt be of immense value for the enormous mass of detailed information it contains.

The architect may very well be charged with a lack of interest in the merely archæological aspect of architecture, and he will bear the charge with equanimity; he deals with a living and growing art; unless he prefers to be Purely Original and let tradition go down the wind he choses to give the work in hand a certain character—and it is all one to him whether any element of it is in an archæologically correct relation to any other element of it; he seeks, or should seek, a point of departure, a start, from which he may produce something new in which its origins are more or less faintly traceable as a Sanskrit root is traceable in a modern word. And therefore the ascription of a building or of a capital to a particular year or even decade is of merely academic interest to him. What do interest him are the broad characteristics of the style of an epoch, the constructive systems, the articulation of its structures, and beyond all these and equaling them in importance, he is interested in the people out of whose life, out of whose physical and spiritual needs they were evolved.

The architect is both analyst and artist, and the artist in him demands for his full satisfaction some veil of glamor, the marshaling of a series of pictures that shall show the warm blood beating through the walls be they of flesh or stone. A synthetic analysis is a demonstration of an anatomical structure stark in death, and the blood does not flow under the bistoury.

And as one closes the book, one wonders whether imagination could not find a place in a serious and accurate archæological work. Is it too dangerous a quality? Would it distort the fact or merely color it? Must the naked fact be seen in the cold and pitiless light that beats upon the dissecting-table, or might it be perceived through the filmy garments of the fancy—none the less the fact, but the fact warmed and vitalized?

The architect desires the beloved fabric of flesh and blood, the archæologist shows him bones and dust.—H. Van Buren Magonigle.

School Houses. The Eleventh Annual Year Book of the Pittsburgh Architectural Club. For sale by James M. Macqueen, Secretary of the Pittsburgh Architectural Club, P.O. Box 816, Pittsburgh, Pa. $1.

This book is a well-printed exhibition catalogue of more than usual interest. It contains copious illustrations of the many new school buildings recently built in Pittsburgh and a few other cities. It should prove to be a valuable reference work for architects and others interested in school buildings of the modern type.

How Shall We Teach Something About Art?

IV. The Painter and the Architect*

By JOSEPH T. PEARSON, JR.

I AM always glad to find myself in the company of architects. Long before I went in for painting, and at the conclusion of my time at the Manual Training School, I was admitted to the office of Wilson Eyre. I remained there for about three years, during which time I was a member of the T-Square Club. Seeing that I was more fond of doing landscapes in pastel than the work of the office, Mr. Eyre advised me to go to the Academy, which I did quite promptly. I then became separated from a vocation which would be very congenial to me and for which I feel I had certain qualifications, though lacking many.

Architecture is, as it were, a pond in which I learned to swim, and while I have been out of it for over fifteen years, I feel that I could swim in it and enjoy the experience if I were to try it once more. The average height of a chair, the usual length of a window-sill or proportions of a door became then, and are still, sort of mental kinks which will remain ever. I was made sensitive to certain refinements of proportion, shape, character, color, finish, and, under the subtle spell of my employer, the romantic, the poetic, the highly imaginative Eyre, I was led in fancy through the fascinating world which his genius and wonderful instincts created, the altogether most distinct and charming world suggested by anyone of my acquaintance.

In this way was established a sort of speaking acquaintance with architecture which has perhaps made it less formidable and cold to me than it may seem to the average painter who has never handled a scale nor seen or smelled an architect's office. One may ask whether I consider the experience profitable. It was very profitable, though many could be found who think otherwise.

All painters should have, and will some day have, some architecture, and the architect should and will have more of painter's training. As evidence of my genuine interest in the architectural profession may I say that I frequently inquire the name of the designer of a building and enjoy visiting a house or bank newly completed. My interest in architecture, I might say, is probably greater than that of the architect in painting. Therefore, when I say that I have quite given up the thought of working in conjunction with architects, they may realize how indifferent are painters generally. They have a very live, if not intelligent, interest in what architects do, but it seldom occurs to them that architects might be interested in what they do. Furthermore, the impression prevails that the architect disregards and disrespects his client's wishes and causes him to spend more than he desires, thus leaving little for the decorators, who, it is said, have a sort of syndicate in New York to secure the little that there is to be done, and that little is, naturally, badly done. The failure of the effort made by the Academy of Fine Arts to embrace a department of architecture for the students of the University of Pennsylvania adds to the hopelessness of any immediate prospect of consolidation of these two intimate arts now separate.

But this discussion is only a preface to a rather more formal and comprehensive statement.

*An address at the May meeting of the Philadelphia Chapter.

The occurrences of the past month have so affected the common course of events that, unless our business in life contributes in some special way to the cause of our country at war, one is disposed and rightly expected to readjust and redirect oneself and one's energies so that the greatest possible concentration of effort shall be brought to bear for the common good for which we and our allies are contending.

It is, therefore, quite difficult, if not inopportune, to discuss the painter's art and its relations to that of the architect; but, inasmuch as the opportunity has not before offered itself to me to present the matter in this pleasant informal way, I gladly avail myself of the chance, with hope that the painters and the architects may again be coördinated as they were when painting and architecture reached their zenith.

It is not likely that that separateness which now exists will be lessened until the painters and the architects have a more common experience in schooling and apprenticeship. Their present absolute disassociation in this respect is largely responsible for their peculiar estrangement, which at times approaches antipathy. They should be brought up under the same roof, as it were, learn the same lessons, play at the same games, and form that partnership which shall, when firmly established, produce the best possible results, both social, material, and artistic.

The architect should realize that it is he who must make the advances, suggest the means, and seek the way whereby the arts shall be united, for he is in the majority, deals in a necessity, and has a certain and generous remuneration. The painters are in the minority, produce a luxury, and receive uncertain and small remuneration. While in no sense less important, the painters are at the architects' command. That the architect does not command or demand them is variously explained and is responsible for the fact that things now painted have scarcely any architectural application. The law of demand and supply would not fail here. What the architect and his client demand will be produced. The fault lies plainly with the architect. He is not totally undesirous of utilizing the painted product for the embellishment of his usually sterile work, but he has not the training that one must needs have to feel the need, to know the character, and understand the application of the painted thing. On the other hand, the painter, the decorative painter, being neglected, spends his talents in other directions; his things finding an occasional place here or there. When he is commissioned he shows a lack of understanding corresponding to that of the architect, and the unhappy result

can be laid to neither one nor the other; they are both ill bred artistically. It is therfore most commendable that architects as an organization realize the imperative need of greater coöperation and manifest it by asking painters and sculptors to meet with them. They thus make those advances which will ultimately create a unity of the arts and, through them, not only finer and more beautiful things, but what is more, a higher civilization.

By what devious means that exalted state is to be reached this war bears witness. Is it not possible that this great calamity with its ensuing griefs will place humanity upon a common plane from which may issue a more concerted effort for the common good which shall include coördination of the arts? Revolution is but the speeding up of evolution, so that the coördination of the arts, which seemed distant, may come strong and lasting from this travail. At the moment the painter and the architect seem to be hopelessly unrelated. The feeble attempts at a partnership are really pathetic. Long unfamiliarity finds them on lofty but separate eminences from which one feebly becks the other. They must get back to a common ground, and then may one accompany the other to his task. Could anything be more calculated to knock them down (for knocked they must be) than the present war?

You see it is impossible for me not to see things in their relation to this world upheaval. We may sow our thoughts as one would peas in a garden infested with ground-moles and find them strewn over the earth tomorrow—nothing is stable now. Reckonings are impossible. We may while away a pleasant evening with this discussion, yet it is but chaff in the wind. We may serve our time and the future as fertilizer, but, even at that, let us merrily sow the thought; another people, another day, may see it realized.

In days of strife, in days of travail, we promise ourselves something better. Today we hear on every hand "The world needs this chastisement; 'twill be the better for it." Fine resolutions are the order of the day. The nonsense is being knocked out of us, and reason lights the gloom of dark despair. We are become more democratic. We shall be as one. Thus, not only shall painting and architecture be united, but they in time will join with other crafts and industries in a more concordant order than the world ever knew.

War is a wild detour from the path of civilization, but cilvilization must be repaired at times. The road will be better when we return to it, if we survive the detour. If there is greater pleasure to be derived from anticipation than from realization, then we should be very happy, for we feel we are in for better things. But this is idle speculation—we are at war. We would not escape the thought, and while we feel the pride of a great cause, we are depressed. Talk as we may of architecture, of painting, *war* looms large and dark before us, and we know we cannot, we should not, put it from us. Whatever the architect or painter may do in the future, he should now war for Liberty and Democracy. It appears to me as being the beginning of the commonalty of experience and aim which I have pointed out as being necessary to insure that unity of effort and consummate attainment we all desire.

The people of the earth, and especially those of this part of the earth, being scattered to the four winds and severed from those traditions and practices that made possible the great achievements of the past, shall, through the prevailing disorder, experience a greater intimacy which will tend to revive and continue the lost traditions. The golden threads of tradition have been broken, and not until they are united may we hope to approach the standards of the past.

The interdependence of people and things has at no time been so evident. Upon the return of peace there will develop a community of thought and purpose one would have considered utopian but a short time ago. The individual will enjoy a new birth of freedom. Fellowship and comradeship will fill him with the zest of life. the desire to serve, the joy of achievement, and there will undoubtedly be a revival of the arts, as well as the humanities.

In the past we have looked to the University to direct our progress, to supply a formula, but now I believe it fails as does the church, each being but evidence of wrong to be righted. In the harmonious interdependent activity of the individual, be he painter, architect, or candlestick-maker, rests the highest destiny of the race. We must rise or fall together. One person, one people, one nation is not sufficient unto itself. If one is descendent and the other progressive, a readjustment must be made. Today that readjustment is being made. We call it war and it appalls us, but thus has the race progressed from stage to stage. Each spasm has been followed by a renaissance. With agonized step man rises to perfection.

To return to our subject. The thing we desire is not an alliance of the several arts; it is a unity of the arts. Fellowships, orders, clubs, and societies—for all of which I have one aversion—are fundamentally selfish. They would enjoy some special privilege and tend to antagonize society. They keep various people separate who would otherwise meet in the common course of events and perform their tasks, one in conjunction with the other, with confidence, affection, and the greatest success. The fundamental thing, the thing to be desired in the crafts, is not organization but disorganization, the free and undirected or unrestricted mingling of all the workers of the earth. This can best be brought to pass in a world democracy wherein, in a measure, there may exist the simple, unfettered life throughout the earth which existed in the various parts of Europe wherein the arts reached their great perfection. To realize the possibility, if not probability, of a great intimacy between all the people of the earth, witness the confluence of the races upon the battlefields of Europe. They will there be welded into one and shall hereafter recognize no boundaries, not even the limitations of the earth.

The conditions which but recently made debatable the wisdom of our taking part in this conflict are disappearing so rapidly that one is astonished that it should not have always been evident that one and another must bear equally the joys and tribulations of life. The barriers of race, creed, and breeding fast disappear, so that no man's life may be or can be hidden from another. His heart and his hand will feel the effect of his fellows, will act in accord, and there shall be a united effort—industrial and artistic.

The imminence of this world federation—which makes the millennium seem far less distant—dispels in us all lesser

considerations. The prospect is thrilling, glorious. It stirs all the finer impulses, and one is eager to spend oneself to hasten its realization.

The structure of colossal blunderings and cross purposes is disappearing rapidly before the onslaught of right, and we see exposed the sure foundations of humanity. You and I go on with this feeble effort at patching the superstructure —the malformations—but we know in our hearts that we labor in vain.

The world is to be rebuilt, so that painting, architecture, music, literature, science and law shall form inseparable and indispensable units in a new structure. We are committed to the task of removing the debris and that rugged portion of the old building which was so firmly but stupidly constructed apart and unrelated to the whole. From the bare souls of men shall rise a new edifice of civilization in which shall be consolidated all the aspirations of race.

The Forum

A Municipal Cannery in Kansas City

To the Editor of the Journal:

The architect's work naturally leads him into thoughts of a sociological nature. When, with all his knowledge of beauty and fitness, he sees the slums and the struggle for existence contrasted with the homes of the wealthy and the privileged, he is—being as a rule an observing man—prone to ponder on the reasons for "things as they are." This is my excuse for offering a story of a cannery to a technical paper devoted to esthetics and various subjects of elevated forehead. Architects, of course, do not as a rule notice such trifles as grocers' bills (?), so they may not—except as they read the papers—know what the dear public is having done to it in the matter of high prices of food.

It happens that I have had wished on me the job (which I enjoy) of administering the funds of the Kansas City Anti-Tuberculosis Society, some $10,000 a year, raised by the Red Cross Christmas Seal campaigns. These funds we use in paying those special expenses of the fresh-air schools that cannot be paid under the constitution of Missouri and the laws made and provided—which sacred documents, though all intelligent people know they are useless—the Missouri public year after year fails to change.

So I notice this rise in the price of food. Also it has been the fortune of our firm to assist in developing some very interesting work done by the city prisoners on our Municipal Farm, where our Board of Public Welfare, who have been splendid citizens doing their work without fear or influence, have pulled off some stunts which, because they are so good, the scornful might call socialistic.

One of these stunts is a small cannery which puts up food raised on the Municipal Farm and provides several thousand gallons of good food for the two or three hundred men whom Society educates and sends to the institution, many to be cured temporarily so they will be in better shape to go back and let Society have another whack at them.

Inasmuch as most of our schools have domestic science departments, and inasmuch as many serve lunches to the children at cost, it had been argued privately with one or two members of the Board of Education that they also, in addition to the Board of Public Welfare, should do one or two of these coöperative stunts.

Of course we architects, being wiser than most, know there are many things communities could do for themselves much cheaper and better than by our neat system of individualism. If this war is good for anything, it may teach us that we can do better.

Well, Hoover began to write things about our food-supply; we had a talk or two from the presidents of our agricultural colleges at the City Club; and the *time* seemed ripe—if not the fruit and vegetables—so I sprung the subject of a cannery on the Board of Education and they fell for it.

One of the most satisfactory things about the matter is that the different departments of the city want to help. This is one of the few times in history where one department of the city wants to help another. It must be that people are all figuring on doing something in the line of food conservation, because the powers that really be (just now) have put the price of cans up fifty per cent in three weeks and seem determined we shan't have them. Well, we shall use champagne bottles if necessary.

The architects well know what is being done in building materials. It is possible some of them may notice one or two details about this food business with more than usual interest; they may have to.

Well we are going to have a very nice little canning and preserving factory in jig time—the Trade School boys will build it. Our gardeners will be taught to preserve and can. We have a municipal garden of about forty acres surrounding our canning factory, and society flocks out there to learn the homely arts of hoeing and weeding. Our hope is that the spirit of coöperation and service now at flow may enable us to accomplish some little good.

For instance, when gardens are producing, a large amount goes to waste—more than one-half. If we can gather this, by the help of Boy Scouts or otherwise, we may save some of it. It might be possible to have people bring in their food, let us can it—if we can get the cans—and take a toll for our trouble.

Of course municipal warehouses, cold-storage plants, and such socialistic activities we won't stand for, until the Government gets around to seizing things!

As to how our little experiment works, I may write you later. We know we can put up enough for the schools to use.

By the way, the latest thing in food is dried food. May we all, during the coming winter, have enough of it—be it canned or dried.—W. C. Root.

News Notes

Annual Meeting—Pennsylvania State Association

The annual convention of the Pennsylvania State Association of Architects was held at Harrisburg, May 15.

The bill recently introduced into the Legislature, providing for the licensing of architects, was endorsed.

The Association pledged itself to conduct an investigation among the presidents of the thirty-seven universities of the United States, conferring degrees in architecture, on their attitude toward conducting more popular lectures on the subject of architecture and on other ways and means calculated to make architecture a part of a liberal education.

Professor Nolan, Chairman of the Institute Committee on Materials and Methods, spoke of the work of his Committee and reported his regret upon the neglect of practical things by architects, impressing those present with the importance of recognizing and using standards. In accordance with his suggestion, the following resolutions were adopted:

"That the Pennsylvania State Association recommends the use of and actually adopts, where they do not conflict with a city code, the standard specifications for Portland cement and structural steel for buildings, as adopted by the American Society for Testing Materials."

"That the State Association records its appreciation of the value of the Structural Service Department in the Journal, and that it congratulates Mr. Boyd for the splendid work he is doing in that connection."

Officers were elected as follows: Albert Kelsey, President, Philadelphia; Frederick A. Russell, Vice-president, Pittsburgh; W. A. Plack, Secretary, Philadelphia; M. I. Kast, Treasurer, Harrisburg.

Open-Stair Tenements

The Brooklyn Chapter of the American Institute of Architects, having had opportunities to review and study the problem exemplified in open-stair tenements recently erected under the existing law, and other types of existing tenements, and to compare them with what they might have been if some of the restrictions had not existed, has passed the following resolutions:

"WHEREAS, Limitations and restrictions imposed by the present Tenement House Law tend to increase cost of living by causing unnecessary expense in construction and uneconomical planning of tenements, and

"WHEREAS, Among the restrictions imposed is the one which makes the open-air staircase plan less effective and not economical in arrangement of space by prohibiting the lighting and ventilating of toilets and bathrooms on the open-stair court recess,

"*Be it resolved*, That the Brooklyn Chapter A.I.A. considers that there is no valid objection to this arrangement of plan and therefore gives its support to a movement which may tend to the elimination of this restriction.

At a more recent meeting held on April 30, when the matter was again taken up, the following resolution was presented and also unanimously passed.

"*Resolved*, That the Brooklyn Chapter A.I.A. advocates and supports the creation of a Board of Appeals which shall have similar powers with regard to the Tenement House Law as are now given the Board of Standards and Appeals with regard to the Building Code of New York City."

If the modifications in the Tenement House Law recommended herein could be brought about by remedial legislation, such buildings as the Vanderbilt tenement, housing 384 families, and the John Jay dwellings, housing 287 families, might be built containing features of plan and arrangement tending to greater economy of floor-space with ample light and ventilation for living-rooms and without interior intercommunication between families.

In a modified form known as the quadrant or saw-tooth arrangement of separate units, the plan is adaptable to the industrial town for the housing of many families with the maximum of light and air and open yards and gardens.

It would seem that the application of the Tenement House Law to varying conditions could be more scientifically administered and with safety, justice, and equity for every interest, by the creation of a Board of Appeals having authority to interpret and pass upon the intent of the law in its relation to the many unusual conditions which are presented through the efforts which are being expended by owners and architects to improve housing facilities both urban and suburban.

The Brooklyn Chapter A.I.A. has also endorsed and approved the Lawson Tenement House bill now before the legislature, and which legalizes the conversion of three-story and basement dwellings into three-family dwellings under reasonable conditions, as being a step in the right direction. CARROLL H. PRATT, *Secretary*.

Central Committee on Preparedness

The minutes of the meeting of the Executive Committee (page 301) contain an excellent account of the work being done by the Institute toward the organization of the profession for coöperation with the Government in war work, while the Journal issued a special News Bulletin on June 2, last, devoted to the same subjects and advising members of the Institute that a further questionnaire would be sent out at once. It is also evident that many Chapters are taking steps to gather information as to the services available among their own members, which information should be made available to the Central Committee of the Institute.

American Architects in France

Among the members of the Red Cross Commission which is going to France to study relief needs of every kind are Mr. George B. Ford, Associate Editor of the City Planning Department of the Journal, and Mr. William Emerson, President of the New York Chapter and a

member of the Institute Committee on Publications. Mr. Ford will consult with the French authorities in regard to rebuilding problems and will be the planning expert attached to the commission.

Medals of Honor for Buildings to be Awarded by the Southern California Chapter

At its last meeting, the Southern California Chapter established three medals of honor to be given annually for buildings erected during the year preceding the date of the award. The first medal is to be for residences costing between $2,000 and $10,000; the second for residences costing above $10,000; the third for work other than residences.

The medals will be awarded, unless there is no work of sufficient merit to justify them in any one year, by a Jury of Award composed of architects and laymen to be elected by the Chapter, the nominations to be made by the president of the Chapter. The medals will be accompanied by a certificate setting forth the name of the structure which formed the basis of award together with a summary of the considerations upon which the medal was conferred.

Obituary

L. E. Masqueray

Elected to the Institute in 1906
Died at St. Paul, Minnesota, May 26, 1917

(Further notice later.)

Institute Business

MEETING OF THE EXECUTIVE COMMITTEE AT ATLANTA, MAY 17, 18

The Executive Committee met at Atlanta, Ga., on May 17 and 18. All members were present, also the Executive Secretary.

Proposed Membership for Educators

The Treasurer read a letter from a member of the Institute, suggesting that the Institute consider some plan for remitting in whole or in part the dues of those of its members who are engaged in teaching in the schools of architecture. The letter was referred to the Advisory Committee of the Committee on Education with a request for its report and advice at the September Board meeting, and the Secretary was requested to consider with the Advisory Committee the question of establishing a special class of Institute membership for educators.

Payment of Examination Fee

On motion duly made and seconded, it was directed as a standing order that the examination fee must be paid by the applicant before the Board of Examiners or Executive Committee will consider his application.

Repairs and Restorations at the Octagon

The restoration of the stable was discussed, as its condition at the present time is dangerous. Mr. Fenner referred to an estimate for a satisfactory restoration at the net cost of labor and material—less than $1,500. Mr. Waid spoke of urgent repairs needed for the Octagon itself, particularly the pointing up of outside masonry.

The following resolution was adopted:

Whereas, It is desired to put the Institute in a position to proceed at once, or as soon as sufficient funds are in hand, to make the stable safe by restoring it in a proper manner, and to put the grounds in good order in line with the future complete restoration of the property, therefore, be it

Resolved, That the Building Committee be and is hereby directed to present to the President and Treasurer as promptly as possible a report giving its recommendations in detail specification form as to (*a*) the restoration of the stable, and (*b*) the restoration or redesign of the Octagon grounds.

Collection of Work of Prominent Members

The President read a letter from Mr. Day suggesting that a library or collection be established at the Octagon for the purpose of preserving the best work of members of the American Institute of Architects, as is now done by the Royal Institute of British Architects.

It was agreed that lack of facilities at the Octagon and the financial limitations of the Institute are such that the Executive Committee fears the plan is not practicable for adoption at the present time. It was suggested that local libraries or state institutions might be utilized as depositories for drawings and plans of the memorable architectural works of the current time.

Sprinkler System Completed

The Treasurer reported that the installation of the sprinkler system at the Octagon is now complete. Sprinkler heads are located in all exposed locations, such as closets, the small stairway, the attic, and the cellar, but there are no pipes in the main rooms of the building. The total cost will be well within the appropriation of $2,000, and there may be a slight saving.

War Services of the Institute—Building Construction

President Mauran summarized the participation of the Institute in the war service of the country as follows:

The work of the Institute may be properly divided into two classes, the first relating to actual coustruction of buildings for war purposes.

In the early part of April, President Mauran received unsolicited offers from various members of the Institute to give their individual services free of cost to the Government in war construction work, thus undertaking such projects at actual cost. The patriotism of these offers so highly commended itself that the proper course seemed to be to give the same opportunity to all members of the Institute. Accordingly, on April 14 a letter was sent to the membership, incorporating the following form of offer for those who desired to take part in the program:

"Through you, as President of the American Institute

of Architects, we tender the services of our office force at cost, and the services of members of our firm without charge, to the United States Government, or to the Red Cross Society, for any architectural work, such as hospitals, designing and construction which may follow the entrance of the United States into the war."

Many responses were received from firms and individuals in practically every city of the country. Mr. Mauran had previously addressed communications to President Wilson and the Secretaries of the War, Navy and Treasury Departments, transmitting an offer of service in the name of the Institute as tendered by its members. Acknowledgements were received from the President and each of these Departments, and on April 19 specific requests were made by the Chief of the Bureau of Yards and Docks of the Navy Department that the Institute undertake, in accordance with its offer, the following projects:

Extension of Naval Hospital, Norfolk.
Extension of Naval Hospital and Medical Supply Depot, Brooklyn.
Marine Barracks, Philadelphia.
Extension of Naval Hospital, Puget Sound, Washington.
Extension of Naval Hospital and Medical Supply Depot, Mare Island, Cal.
Extension of Naval Hospital, Pearl Harbor, T. H.

The Bureau was advised in reply that the Institute would immediately undertake this work, and on April 28 Mr. Mauran and Mr. Fenner met at Washington for a conference with Admiral Harris, Chief of the Bureau of Yards and Docks, and Assistant Secretary Franklin Roosevelt of the Navy. Both expressed the keenest interest in and appreciation of the Institute's generous offer of coöperation for this emergency. It was agreed with the Navy Department that the services to be performed in each case are to be those of the American Institute of Architects and not those of any individual architect or firm. To this end committees of three have been appointed in Washington, Philadelphia, New York, Baltimore and San Francisco.

The business arrangement with the Navy Department is that the work is to be performed by the Committee on a basis of actual cost, which is to be determined by doubling the cost of the draughtsmen's time The members of the Committee will receive a nominal per diem to comply with the law, which prohibits the Government from accepting gratuitous service. Any traveling expenses by order of the Department are to be paid by it. These six projects are waiting on the passage by Congress of the necessary appropriation, and it is hoped will be completed in record time and in the most efficient manner, so far as the architectural services are concerned.*

Subsequent to the agreement to undertake these projects, it was learned that the Council of National Defense in Washington was about to issue a report advising the Federal Departments to make no contracts based on services volunteered at cost. As this concerned the entire program of the Institute, President Mauran met with the members of the Munitions Board of the Council in Washington on May 14, as a result of which a formal letter was addressed to its Chairman, Hon. Frank A. Scott, under date of May 15, 1917, also a letter on the same subject to Admiral Harris of the Bureau of Yards and Docks under date of May 15, outlining the position of the Institute and its willingness to continue its program as first established, but also expressing a willingness to adopt any course which the Council and the Department might decide upon as the proper method of doing the work for the Government.

After full consideration, it was resolved that these letters be approved as stating correctly the position of the Institute.

It was agreed that an explanatory letter from the President be sent to each of those who has volunteered as well as to the committees on the projects already assigned. This letter will state that the work now in hand, as well as all future work, will be handled on such basis of compensation as the Council of National Defense and the Department may determine upon as being most acceptable to them. A somewhat similar letter will be sent to all Institute members, stating that with respect to future work the Institute will be guided by the Council. The reasons for this decision are to be clearly set forth.

The second part of the Institute program has to do with the mobilizing of trained men. A Central Committee on Preparedness, under the chairmanship of Mr. Evarts Tracy of New York, sent out in April a circular letter, with a volunteer service blank attached, to 8,000 architects. To date about 2,500 responses have been received from men who are willing to serve where their training will be of the most value. A second circular, addressed only to Institute members, has already been sent out, with the request that the technical employees of firms and individuals be given an opportunity to volunteer their services and to register at the Octagon. It is believed that the responses of this circular will bring the register of the Institute to a total of at least 5,000. (This letter was sent out in Special Journal Bulletin No. 5, and outlined the plan for holding in abeyance the enrollments made at the Octagon and called for responses from draughtsmen and others who have not registered.—EDITOR.)

Officials of the War Department have expressed gratification that this work is being done and are of the opinion that it will prove of value later on.

Under the present plan of procedure, a request for a specific number of men for a particular project in any specified state, coming from a branch of the National Government, will be referred at once to the president of the Chapter having jurisdiction, together with a complete summary of those who are registered for his territory, such summary to show the special qualifications and general fitness of each individual. The Chapter President will thereupon make the necessary assignments and conduct the correspondence with the Federal authorities. Chapter presidents have been fully advised of the part they are to take.

In conclusion, Mr. Mauran said that he had communicated with the Director of the American Red Cross, the National Committee of Patriotic and Defense Societies and the Secretary of the National Association of Master Builders Exchanges for the purpose of making known the general program of the Institute and obtain-

NOTE.—Congress has so far failed to provide the funds for this work.—EDITOR.

ing the interest of these organizations. A request received from the Council of National Defense that the Institute assist the Council in rendering a specific service has been complied with by appointing the president and secretary of each Chapter to act in the manner desired. The President was requested to write to Chairman Scott concerning the registration list, inquiring as to what the Institute should do to prevent the selection by draft of the architects and draughtsmen registered thereon. The President will also communicate with the proper authorities of the War Department.

Preparedness Fund

The Treasurer reported that after conference with the President and Mr. Tracy, Chairman of the Committee on Preparedness, he had called for contributions with which to finance war services of the Institute. To date of May 14, 1917, the receipts have been $485.65 and expenditures $445.05. Mr. Fenner pointed out that drastic action should be taken to finance the operations of the Institute for the balance of the year, so far as its war service work is concerned, for the Budget as drawn will permit small leeway for such expenses. After a complete survey of the situation it was resolved that the appropriations of the following committees be reduced in the amounts indicated below: The chairman of each committee will be notified by the Treasurer, and the various sums are transferred to the Contingent Fund.

Allied Arts (Medal)	$50 00
Basic Building Code	75 00
Education	25 00
Public Works	75 00
Historic Monuments	25 00
Practice	75 00
Public Information	25 00
Lincoln Highway	40 00
Historian	100 00
	$490 00

Standard Form of Chapter Constitution and By-Laws

The Secretary submitted a report from the Chairman of the Committee on Chapters under date of May 15. This report submitted a draft of standard Chapter Constitution and By-laws which had been transmitted to the various Chapters for comment, together with notes on the document as received and recommendations by the Chairman of the Committee on Chapters. The Executive Committee deemed it inexpedient to review the form in detail and authorized the issuance of a standard form approved by the Chairman of the Committee on Chapters and the Secretary of the Institute.

Chapter Affiliates Since the Date of the Fifitieth Convention

The Secretary reported that, regardless of the distribution of the Institute Constitution and By-laws in draft form prior to the Convention, the action of the Convention in adopting the same in principle, notices in the Journal, and at least two circular letters to Chapter secretaries, various Chapters have insisted upon electing affiliates as "Members" rather than "Associates," though such Chapters have no Associate Class. There are about forty of such affiliates in various Chapters elected on the old membership forms, which have been sent to the Octagon for filing. About twenty-four who applied for "membership" before the Convention have been elected as members since the Convention.

The standard application for associateship was distributed about March 1. It is believed that the adoption of the Standard Chapter Constitution and By-laws will put an end to this practice, and, in the meantime, uniform procedure should be devised for correcting these obvious mistakes after the Associate Class has been established in each Chapter. It was resolved that the situation be left in the hands of the Secretary for such action as he may deem desirable.

Reinstatement of Members

The Secretary stated that in his opinion the By-laws of the Institute should contain some definite provision relative to reinstatement of members whose membership had been discontinued.

He found that in the past the Board has in a number of instances reinstated members on the merits of each particular case. The procedure suggested is that the former members shall make application for reëlection on the prescribed application form, and the question of remitting the initiation fee and back dues will be considered and decided upon by the Board on the merits of each particular case.

Proposed Amendment to Article I of By-Laws

The Secretary referred to a resolution of the Fiftieth Convention which instructed the Board of Directors to consider the changing of the wording of Article I of the By-laws which reads "Any resident of the United States," etc., to "Any resident who is a citizen of the United States," etc.

The Executive Committee was of the opinion that no change should be made in the Constitution as it now stands, but the subject was held over for the Board at the next meeting.

It was pointed out that the Institute is primarily a professional body, without reference to citizenship, and as a matter of principle a resident of a foreign country should not be barred. American architects are not barred in various foreign societies of good standing.

Report of Committee on Contracts and Specifications

Mr. Frank Miles Day, Chairman of the Committee on Contracts and Specifications, submitted a report concerning matters now in his charge. This was read in full and approved, as follows:

"*Handbook:* The manuscript of the first draft of the Handbook of Professional Practice and Business Administration is now finished. Proofs of the earlier pages have been received and the matter is rapidly advancing.

"It is my purpose, as soon as proofs are completed, to send a copy to every member of the Board, to the Standing Committee on Contracts and Specifications, to the Committee on Publications, to each Chapter, to the Institute Counsel, and to a selected list of persons who take a peculiar interest in the subject of the book.

"Upon receipt of criticisms from those thus addressed, a second draft will be prepared by the Standing Committee which draft will be issued in the Journal of the Institute and thus made available for criticisms by every

member of the Institute and any others who may wish to send them. The work in the Journal will be printed in such form that from its type the matter may be published as a book. Opinion grows that when the Handbook ceases to be the work of one individual and comes, through general criticism, to express the consensus of opinion of the profession, it will be of distinct value to the classes for whom it is intended, to wit, students, the younger members of the profession, and owners.

"*Contract Documents:* Revision of the Institute's Contract Documents has called forth suggestions for changes in various details. These have been scheduled and submitted to the members of the Standing Committee. (See "Contract Documents" below.)

"*Form of Agreement* between Architect and Owner when a Percentage of the Cost of the Work forms the Basis of Payment. This form has been revised, reprinted and re-issued.

"*Form of Agreement* between Architect and Owner when cost plus a fee forms the basis of payment is ready, final proof is satisfactory to all concerned, and it is now about to be printed and published.

"*Form of Agreement* between Contractor and Owner when cost of the Contractor's work plus a fee forms the basis of payment. As previously reported, the Chairman of the Committee has been at work upon the first draft of this agreement. The circulation of that draft to members of the Standing Committee, to contractors whose work has been done chiefly by that method, and to others, has elicited so lively an interest in the publication of such a form of contract, has brought so many suggestions and so many statements that the work was well worth while, that the subject has suddenly assumed an importance and taken on difficulties which at first were quite unforeseen. Your Committee will continue to work upon this subject and will in due time present to the Executive Committee a second draft which will doubtless differ in many particulars from the draft heretofore submitted to you.

"*Agreement with Brief Conditions:* The subject of a form of agreement with brief conditions suited for purchases, such as metal furniture, elevators, etc., has been referred to a Subcommittee consisting of Mr. A. B. Pond and Mr. Frederick W. Perkins, who have submitted a preliminary report outlining their proposed method of attacking the subject. They have been instructed to proceed along the lines indicated in their report and, doubtless, in due course, they will present at first a draft of such an agreement and general conditions.

"*Schedule of Charges:* The revision of the Schedule of Charges which was one of the duties imposed by the Board upon the Standing Committee has received the approval of the officers of the Institute, and has been printed and published."

Contract Documents

Mr. Medary, Vice-Chairman of the Committee on Contracts and Specifications, submitted a report in detail recommending certain revisions to the Contract Documents of the Institute as they now stand. These revisions were arrived at after extended conference with legal counsel, members of the Committee, prominent users of the documents, Mr. Waid and Mr. Jones, of New York, and the New York Employers' Association. The report was summarized by the Secretary, who mentioned the principal changes in substance. The Executive Committee affirmed the changes in principle and authorized the issuance of a third edition in such form as the Committee on Contracts and Specifications may suggest, subject to the approval of the Secretary and the Treasurer, with the recommendation that they give careful consideration to the details relating to the issuance of the third edition so that the purchaser will be fully advised of the changes and warned against the use of copies of the second edition and third edition jointly in any one contract.

Membership Status of Resigning Members

It was resolved, as a standing order, that the Chapters be requested to advise the Secretary of the Institute before accepting resignations of Institute members; and the Secretary of the Institute will advise Chapter Secretaries in like manner. This will prevent the acceptance of a resignation by the Institute when charges are pending in the Chapter against the member resigning and vice versa. It will also place a check on any financial obligation which the resigning member may have to his Chapter or the Institute.

Meeting with Georgia Chapter

On Friday evening the Georgia Chapter entertained the members of the Executive Committee and visiting architects from Florida, Alabama, and Tennessee at an informal dinner at the Piedmont Driving Club. The President of the Chapter, Mr. William J. Sayward, presided at the gathering.

Short addresses were made by the officers of the Institute and by the visiting architects and those of Atlanta. All spoke of the great advantage to the Institute and the profession of this acquaintanceship and exchange of ideas. The members of the Georgia Chapter were most appreciative of the visit of the Executive Committee, which was unanimous in expressing the thought that the journey to Atlanta had been of great value in bringing about a clearer realization of conditions in the South and a more sympathetic point of view for the problems of the profession there.

Winners of the A. I. A. Student Medal for 1917

Carnegie Institute of Technology: Howard Leland Smith.
Columbia University: Walter Feasel Wilson.
Harvard University: Eugene Dodd.
University of Illionis: Charles Russell Federman.
Massachusetts Institute of Technology: Harold Sterner.
University of Minnesota: Donald Henry Buckhout.
Syracuse University: Carl Milnes Snyder.
Washington University: Raymond Louis Herbert.

New Members Elected May 18, 1917

Bennes, J. V.	Portland, Ore.
Davidson, F. E.	Chicago, Ill.
Eisen, Percy A.	Los Angeles, Cal.
McDowell, J. H.	Burlington, Vt.
Sayre, C. Gadsden	Anderson, S. C.
Scheibel, Morris W.	Youngstown, Ohio
Stanley, E. A.	Youngstown, Ohio

Structural Service Department

In connection with professional societies and organized bodies working toward the improvement of building materials and methods, and the following Committees of the Institute:

BASIC BUILDING CODE

WILLIAM B. ITTNER, *Chairman* . . . St. Louis
W. W. TYRIE . . . . . Minneapolis
G. F. A. BRUEGGEMAN . . . . . St. Louis
OWEN BRAINARD . . . . . New York
ROBERT STEAD . . . . . Washington
E. D. LITCHFIELD . . . . . New York

FIRE-PREVENTION

ROBERT D. KOHN, *Chairman* . . . . New York
W. L. PLACK . . . . . Philadelphia
G. C. NIMMONS . . . . . Chicago
JOHN R. ROCKART . . . . . New York
CHARLES H. BEBB . . . . . Seattle
LYMAN A. FORD . . . . . New York

CONTRACTS AND SPECIFICATIONS

FRANK MILES DAY, *Chairman* . . . . . Philadelphia
M. B. MEDARY, JR., *Vice-Chairman* . . . . . Philadelphia
ALLEN B. POND . . . . . Chicago
SULLIVAN W. JONES . . . . . New York
FREDERICK W. PERKINS . . . . . Chicago
JOS. EVANS SPERRY . . . . . Baltimore
J. A. F. CARDIFF . . . . . New York
GOLDWIN GOLDSMITH . . . . . Lawrence, Kan.
JULIUS FRANKE . . . . . New York

MATERIALS AND METHODS

THOMAS NOLAN, *Chairman* . . . . . Univ. of Pa.

(Each Chapter has a corresponding member who is chairman of the Chapter Subcommittee)

June, 1917, Serial No. 6. Electricity

A part of the service of this Department will be to furnish inquirers with additional information, titles of books, names of authors or publishers, copies of articles, or in any way to afford help to architects wishing to ascertain the latest data available in connection with any material or method. For this service, address the Journal of the A. I. A., the Octagon, Washington, D. C. The service is free, except where clerical expense is involved, in which case a small fee will be charged to cover actual cost. The inquirer will be advised of the amount of the fee before any research work is undertaken.

The Journal of the American Institute of Architects
The Octagon
Washington, D. C.

Structural Service Department

D. KNICKERBACKER BOYD, *Associate Editor*

ELECTRICAL ISSUE

CONTENTS

The purpose this month is to place before the readers of the Journal a résumé of matters electrical applying to buildings, their construction and equipment. Practice in this respect has been standardized to an extent perhaps not excelled by any other science or industry. And yet improvement is constantly taking place. For some years the leading activities in the development of electrical utilization within and around buildings have centered about the revision of the National Electrical Code, the requirements of which have long been recognized as affording the working basis necessary for a unison of purpose on the part of all interests in the electrical field.

The plan of presentation is revealed in the Index:

INDEX TO SUBJECTS TREATED IN THIS ISSUE

(For index of materials previously treated see the General Index, page XIIc.)

6A Electrical Societies, Associations, and Allied Agencies.

6B Others Having Important Electrical Committees.

6C The National Electrical Code.

6D1 The National Electrical Safety Code.

6E Apparatus, Appliances, and Installations in General.

6E4 Standard Symbols and Charts.

6F Electric Elevators, and Dumbwaiters.

6G Telephones, Signaling Systems, Clocks, and Bells.

6H Illumination, Lighting Fixtures, and Lamps.

6J Heating, Cooking and Other Appliances and Devices.

6K Vacuum Cleaners.

6L Mechanical Equipment of Federal Buildings.

6M Lightning Protection.

6N Electrolysis.

Electrical Societies, Associations, and Allied Agencies

6A1 *American Institute of Electrical Engineers*

Secretary: F. L. Hutchinson, 33 W. 39th St., N. Y. C.

Publications:

(*a*) Proceedings. Published monthly, in two sections. One section contains news and notices of interest to members, and the other contains technical papers, discussions, reports of committees and other matters of an engineering character. $10 annually.

(*b*) Transactions. Published annually, containing selected technical papers, discussions, and reports, and forming a permanent record of the progress of electrical engineering.
Existing bound volumes may be purchased by non-members at $10 in paper; $11.50 in cloth.

(*c*) Separate Papers and Discussions. Certain of those contained in the Proceedings and Transactions can be furnished separately at 50 cents each.

(*d*) Standardization Rules. Revised Edition.
Gives standard definitions of electrical terms, technical data, standard performance specifications, and tests of electrical machinery, standard voltages and frequencies, and general recommendations, as adopted by the Standards Committee and approved by the Board of Directors, June 30, 1915, to take effect July 1, 1915. Price 25 cents.

(*e*) Year Book.

The Institute has technical committees covering practically the entire electrical field, those concerned with matters of interest structurally being Electric Lighting Committee, Standards Committee and Code Committee.

The work of the Standards Committee is of great value to the profession and to every user of electrical power. The main purpose of this Committee, hitherto aimed at in the rules, has been to draw up engineering definitions of terms, phrases, and requirements relating to electrical machinery and apparatus, so that the meaning of technical terms might be standardized among the members of the Institute. (See 6E3 for description of these Standardization Rules.)

6A2 *The Society for Electrical Development*

General Manager: J. M. Wakeman, 29 West 39th Street, New York City.

Public Information:

Issues no publications for general distribution. A possible exception to this is a reprint of "Useful Electrical Information for Architects, Contractors and Engineers." Copies furnished practising architects upon request.

The Society maintains, and through painstaking research work is constantly adding to, an extensive library of electrical information, including records of electric rates and data concerning engineering work, all of which material is carefully classified and filed for ready reference.

One of the Society's activities has been to coöperate

with the Wiring Committee of the National Electric Light Association and H. C. Cushing in preparing a special section of over fifty pages on "House Wiring" in the "Cushing Standard Wiring Handbook."

[NOTE.—While the general uses and advantages of electricity are known to all, it is impossible for anyone not in touch with the industry to know of the constant changes which are being made in the means of supply and the many improvements which are taking place in the means of its utilization. In planning electrical service it is always wise to consult with local electrical interests—the central station management, electrical or consulting engineers, and electrical contractors, of known reliability—as they are familiar with local ordinances, inspection rules, and terms of service, but the Society will gladly aid the architect and all builders in other directions.]

6A3 *National Electric Light Association*

Secretary: T. C. Martin, 29 West 39th Street, N. Y. C.

Publications:

(*a*) Proceedings, and (*b*) Reports, issued annually.
(*c*) The N.E.L.A. Bulletin, issued monthly, for members only and for distribution to institutions of learning, so as to be accessible to the many engineering students.
(*d*) Handbooks, which are permanently valuable contributions to the literature of electricity and have received wide appreciation, not only from public utility companies and their employees, but from college professors and students in colleges and technical schools.
(*e*) Booklets are issued from time to time through the commercial section of the Association, with the aim of promoting better conditions of service to the public.

Many other publications are issued, some of which will be found referred to under subdivisions later.

The National Electric Light Association was organized in 1885 to foster and promote the effectiveness of the service furnished by electric central station corporations engaged in the production, transmission, and distribution of electricity, in supplying the public with light, heat, power, and other forms of service.

At a very early stage the Association took part in the now universal "Safety First" movement, and is at present coöperating with the U. S. Bureau of Standards in the development of the National Electrical Safety Code.

The Association maintains a Lecture Bureau and is also one of the bodies represented on the Electrical Committee of the N. F. P. A. in charge of the National Electrical Code.

The engineering and attendant scientific and educational work of the Association is carried on through appropriate subdivisions or sections of the national organization known as the Technical and Hydro-Electric Section, the Commercial Section, the Accounting Section, and the Electric Vehicle Section, and through Committees, of which there are now about 70 with some 500 leading experts in their membership.

6A4 *National Electrical Contractors' Association of the U. S.*

Secretary: H. C. Brown, 41 Martin Building, Utica, N. Y.

Publications:

(*a*) Standard Symbols for Wiring Plans, as adopted and recommended by the National Electrical Contractors' Association and the American Institute of Architects. Copies may be had without charge upon application to the Secretary of the Association, or to the Executive Secretary of the American Institute of Architects at The Octagon, Washington, D. C.
(*b*) National Electrical Contractors' Association Standard Conduit Charts, showing standard sizes of conduits for the installation of wires and cables, adopted and recommended by the N.E.C.A. of the U. S. and required by the National Electrical Code; completely illustrated with drawings of conduits, wires and cables at one-half full size; copyright 1912. These are mounted upon boards 21½ by 30, and may be obtained upon application to the Secretary, at a price of $3. Postage additional.
(*c*) *The National Electrical Contractor* is the official journal of this Association and covers a wide field in the electrical industry.

This Association was organized in Buffalo, 1901, by forty-nine progressive electrical contractors who were desirous of raising the standard of electrical contracting to the plane of a profession, and the objects were, in chief, to collect for electrical contractors and dealers important information which they could not get independently. The main objects are:

Committees exist to solve various problems for the members and allied electrical interests. The Association is represented on the Electrical Committee of the N. F. P. A in charge of the National Electrical Code and is also represented in all the important electrical societies and organizations.

6A5 *National Board of Fire Underwriters*

See March Journal, Serial No. 3A4, for description of activities and list of publications, and see, also, 6C.

6A6 *Local Underwriters' Associations*

See March Journal, Serial No. 3A5, for description, and 3A2 for coöperation with architects. For the convenience of architects, engineers, and constructors, a colored map of the United States, 28 x 14 inches, is issued by Ream, Ives & Wrightson, Insurance Brokers, 24 Broad Street, New York City. It shows the territory under the jurisdiction of the various boards and bureaus making electrical inspections and fire insurance rates. Price, $2.50.

6A7 *Underwriters' Laboratories, Electrical Department*

For other descriptions of activities and publications see 3A6 and previous issues of the Journal including Industrial Sections:

Electrical Publications:

(*a*) List of Inspected Electrical Appliances (see Standards Adopted and Progress Reported, 6E3*d*).
(*b*) Electrical Data (see Information Obtainable, 6E1*x*).
(*c*) Standard on Rubber-Covered Wires and Cords (3A6*f*).
(*d*) Standard on Cabinets and Cut-out Boxes (3A6*j*).
(*e*) Standard on Flexible Steel Armored Cables.
(*f*) Standard (Tentative) for the Construction and Installation of Materials for Lightning Rod Equipments (3A6*k*).

NOTE.—(*a*) and (*b*) revised semi-annually; sent free upon application. (*c*), (*d*), (*e*) and (*f*) for sale in printed form at $1 per copy. Other standards in mimeographed form, some of which will be printed later.

The testing of electrical appliances and electric wiring materials was the first work undertaken by Underwriters' Laboratories; it has always been a very important division of the activities of the institution. Two electrical laboratories are maintained, one in Chicago and the other in New York. Underwriters' Laboratories' Councils are bodies of experts having extensive field experience, as relates to fire and accident protection, with the products upon which Underwriters' Laboratories is called to pass. The Councils review and criticize reports on laboratory tests on products that have been submitted for investigation and listing, and the members are called upon to register their approval or disapproval of the recommendations of the Laboratories' engineers before any product investigated can be listed as standard. In various other advisory capacities these bodies also serve the institution. There are three Councils: The Fire Council, the Casualty Council, and the Electrical Council.

Underwriters' Laboratories' Electrical Council consists of forty-eight prominent electrical engineers and inspectors, including, in addition to Underwriters' representatives, two representatives of the Federal Government, a representative of the Hydro-Electric Power Commission of Ontario, and engineers and inspectors from municipalities, New York and Chicago being among these.

As has been pointed out in previous issues of the Journal, suitable supervision of the factory output and a comprehensive field follow-up are employed on all products carried as standard in the Laboratories' lists. The Label Service, described in detail in the January, 1917, Journal, is the system of supervision follow-up most extensively employed in the electrical industry, as in other industries. Electrical appliances and materials passed by Underwriters' Laboratories may be identified by means of Underwriters' labels on the goods themselves, except in relatively few instances where labeling is impracticable. The labeling may consist of a marker attached or of a permanent marking in the material, the latter being known as die labeling.

For further and more detailed information in this issue concerning Underwriters' Laboratories see 6C2 and Industrial Section, p. xix.

6A8 *Associated Factory Mutual Fire Insurance Companies*

For description of same and of Inspection Department and for complete list of publications see March Journal, Serial No. 3A7. For the two publications especially relating to electrical subjects see "Standards Adopted" 6E3*a*. Of these the "Electric Rules," which is the National Electrical Code illustrated by cuts and with explanatory footnotes, has been adopted as a textbook in several educational institutions throughout the country.

The Associated Factory Mutual Fire Insurance Companies are represented on the Electrical Committee of the N.F.P.A.

6A9 *National Fire Protection Association*

For complete description and list of all publications see March Journal 3A3.

The Biennial revision of the National Electrical Code is now in the hands of the Electrical Committee of the N.F.P.A. as explained in the introduction to the Code under 6C. The contemplated 1917 revision did not take place for the r easons stated, in the Report of this Committee to the Convention of the N.F.P.A. in Washington May 8–10, 1917, as follows:

(*a*) *Report.* "Owing to the injunction granted without a hearing by the New York Court at the prayer of a manufacturer of fuses against all the members of the Electrical Committee, the regular biennial open meeting of the Committee was not completed."

"The preliminary injunction has been dissolved and it is hoped to complete the work of the meeting at an early date."

F. E. Cabot, *Chairman.*

6B *Other Electrical Associations.*

American Electric Railway Association, New York City; Associated Manufacturers of Electrical Supplies, New York City; Association of Edison Illuminating Companies, San Francisco, Cal.; Association of Iron and Steel Electrical Engineers, McKeesport, Pa.; Association of Railway Electrical Engineers, Chicago, Ill.; Canadian Electrical Association, Toronto, Canada; Electrical Manufacturers' Club, Syracuse, N. Y.; Electrical Supply Jobbers' Association, Chicago, Ill.; Electric Power Club, Chicago, Ill.; Jovian Order, St. Louis, Mo.; National Association of Electrical Inspectors, Concord, Mass.; Institute of Electrical Contractors, New York City.

Other national associations having committees concerned with the use of electricity in buildigs are:

American Society for Testing Materials (1A4), American Railway Engineering Association (1A9), American Society of Mechanical Engineers (Serial No. later), Western Society of Engineers, with headquarters at Chicago, maintains an Electrical Section administered by an Executive Committee.

(For educational institutions in connection with research work in electricity and testing facilities, see 1B3*a*.)

6C The National Electrical Code

EVOLUTION OF THE CODE

(*a*) The position occupied by the National Electrical Code is a unique one. So far as the rules themselves go, they are but little more than recommendations. But they are so wisely drawn and specify so well what is necessary for safety in electric wiring that all insurance and electrical interests accept their recommendations with seldom a question, while municipal boards enforce them as ordinances.

The New York Board of Fire Underwriters issued, in October, 1881, the first printed requirements on electric wiring. A few days later the Boston Manufacturers' Mutual Fire Insurance Company issued a similar document. Early in 1882 both of these organizations issued circulars containing a few rules on electric wiring. Soon thereafter the National Board of Fire Underwriters adopted the requirements of the New York Board. In this same year (1882) the Boston Board of Fire Underwriters issued a set of rules, as did the New England Insurance Exchange in 1885.

In the first part of the year 1890, six of the insurance organizations issued quite complete sets of rules relative to the installation of electric wiring. In 1891 the National Electric Light Association adopted a code of wiring rules prepared by this bureau, and in 1892, a convention of insurance men met in New York and made such revisions in the rules which had been adopted by that body as seemed wise. At a second meeting in December of the same year, attended by representatives from insurance boards all over the United States and from many sections of Canada, the Underwriters' National Electrical Association, a permanent organization was effected and an Electrical Committee appointed, consisting of electricians in the employ of insurance interests, whose duties were to be the care of the rules, the making of tests, and the giving of information and advice to the Association.

At the next meeting of the Underwriters' National Electric Association in Chicago in 1893, and at a subsequent meeting in Boston the same year, the rules were revised again. In February, 1894, they were adopted by the National Electric Light Association; before the close of the year, by six additional insurance boards, coming thus into use by insurance inspectors all over the United States. The plan was then adopted of having all the printing of the rules done by the National Board of Fire Underwriters and having no changes made in rules except through this Board.

By 1895 the rules had been adopted practically by all the Underwriters' associations, forty of which were using copies of them printed from the same type. Moreover, they had been accorded the approval of many electrical manufacturers and prominent central-station men, and

had been incorporated into the ordinances of fifteen or twenty leading cities.

In October, 1895, a communication was sent out on behalf of the National Electric Light Association, suggesting a joint conference, to be composed of delegates from the American Institute of Electrical Engineers, the American Street Railway Association, the National Board of Fire Underwriters, the American Institute of Architects, the International Fire Chiefs' Association, the American Bell Telephone Company, the Western Union and the Postal Telegraph Companies, the General Electric Company, the Westinghouse Electric and Manufacturing Company, the National Electric Light Association.

From this meeting a National Conference on Standard Electrical Rules was organized in 1896, and a Committee appointed to amend and codify the rules. This Committee decided that the rules promulgated by the Underwriters' National Electric Association offered the best basis for a standard set of rules. That Committee prepared a number of suggestions for changes in and additions to the Underwriters' rules. Most of these suggestions were adopted and the Underwriters' National Electric Association immediately set to work to revise and recodify the rules.

The revised rules were approved by the Code Committee of the National Conference and promptly indorsed and adopted by the National Electric Light Association and other interested organizations.

Thus there came into existence in 1897 the "National Electrical Code."

The assistance which Mr. C. M. Goddard, of Boston, rendered in the creation of the Code attracted such wide attention to his enthusiasm and ability that when the Underwriters' National Electric Association was formed he was made its secretary. Because of the exercise of these same qualities, he was in 1911 retained in the Electrical Committee of the National Fire Protection Association in the hands of which Committee is now placed the biennial revision of the National Electrical Code.

When a revision takes place the Code is adopted and published as "Regulations of the National Board of Fire Underwriters for Electric Wiring and Apparatus, as Recommended by the National Fire Protection Association."

The Code, with its amplifications for the design and construction of appliances, as mentioned under 6E3*a*, then becomes the National Standard pertaining to electric wiring and apparatus—and is administered by local Inspection Departments, for which see 6A6.

The Editor wishes to pay especial tribute on behalf of architects to Mr. Alfred Stone who for over ten years so well and so assiduously represented the Institute as its delegate to the National Conference on the Electrical Code. The Reports to conventions year after year will be found printed in the "Proceedings" (1A8*l*).

(*b*) The Code is divided into six sections under the designations Class A, B, C, D, E, and F, as listed below. The reader is referred to the Code itself for all detailed descriptions, except the General Suggestions which are here printed in full for the recommendations which they contain.

Copies of the Code may be obtained from the National Fire Protection Association, the National Board of Fire Underwriters, the Underwriters' Laboratories, the Associated Factory Mutual Fire Insurance Companies (see 6A8 and 6E3*e*), and from all local underwriters' associations or inspection departments.

6C1 *National Electrical Code—General Suggestions* (quoted from the Code)

"The following general suggestions, as well as the fine print notes in the rules, are simply suggestions and explanations and are in no case to be considered by inspection departments as mandatory."

"In all electric work, conductors, however well insulated, should always be treated as bare to the end that under no conditions, existing or likely to exist, can a ground or short circuit occur, and so that all leakage from conductor to conductor or between conductor and ground may be reduced to the minimum.

"In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors, and securing and attaching of fittings, are specially conducive to security and efficiency, and will be strongly insisted on.

"In laying out an installation, except for constant current systems, every reasonable effort should be made to secure distribution centers located in easily accessible places, at which points the cutouts and switches controlling the several branch circuits can be grouped for convenience and safety of operation. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

"The use of wire-ways for rendering concealed wiring permanently accessible is most heartily endorsed and recommended; and this method of accessible concealed construction is advised for general use.

"Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires, and also for telephone, district messenger, and other signaling system wiring."

6C2 The Other Sections of the Code Are:

Class A, *Generators, Motors, Switchboards, etc.:* (Includes electrical equipment of Central Stations, Dynamo, Motor and Storage-Battery Rooms, Transformer Sub-Stations, etc. Rules 1 to 11.): Class B, *Outside Work;* (Not including wiring for Light, Power and Heat, Protected by Service Cutout and Switch. For Signaling Systems see Class E.) All Systems and Voltages. (Rules 12 to 15.): Class C, *Inside Work;* (Including all work for Light, Power and Heat, Protected by Service Cutout and Switch. For Signaling Systems see Class E.) General Rules, all systems and voltages. (Rules 16 to 19.) Constant-Current Systems. (Rules 20 to 22.) Constant-Potential Systems; General Rules, all voltages. (Rules 23 to 25.) Low-Potential Systems, 550 volts or less. (Rules 26 to 43.) High-Potential Systems, 550 to 3,500 volts. (Rules 44 to 46.) Extra-High-Potential Systems, over 3,500 volts. (Rules 47 to 48.): Class D, *Fittings, Materials and Details of Construction;* All systems and voltages. (Rules 49 to 84.): "This section of the Code relating to the design and construction of appliances is but a partial outline of specifications. Underwriters' Laboratories has complete standards for electrical fittings which include the provisions of this Code and in addition specifications for performance under test and in service and further details of design and construction. Copies of these standards will be furnished electrical inspection departments, manufacturing concerns, national electrical associations, societies and institutes, and copies filed with the Bureau of Standards, Department of Commerce, Washington, to which Bureau may be referred questions as to the correctness of the Laboratories' tests": Class E, *Miscellaneous;* (Rules 85 to 89.): Class F, *Marine Work.*

6D1 National Electrical Safety Code

(*a*) After three years of continuous study and investigation and the thorough revision of successive preliminary drafts submitted for discussion and criticism, the Bureau of Standards, in Circular No. 54, Second Edition, November 15, 1916, presents the completed text under this title "National Electrical Safety Code for Examination, Trial, and Constructive Criticism." Copies may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20 cents each, paper bound; 30 cents each in cloth.

In addition to two introductory sections giving definitions of terms and rules for the grounding of apparatus and circuits, the Code consists of four principal parts, as follows:

1. Rules for the installation of machinery, switchboards, and wiring in central stations and substations.

2. Rules for the construction of overhead and underground lines for the transmission and distribution of electrical energy and intelligence.

3. Rules for the installation of electrical apparatus and wiring in factories, residences, and wherever electricity is utilized for light, heat or power.

4. Rules for safeguarding employees when working on or near electrical machines or lines.

This Electrical Safety Code, more particularly Part 3, on Electrical Utilization Equipment, runs parallel with the National Electrical Code (for fire-protection). As it was desirable that there be no conflict between them, and as little overlapping as possible, the Bureau came to an early understanding with the Electrical Committee of the National Fire Protection Association as to the relations between the two codes. The Bureau offered originally to coöperate with the Electrical Committee in framing safety rules to be incorporated in the present electrical code, but at a conference it was found to be the general desire to keep the safety rules and the fire-prevention rules as distinct as possible and have these two parts of a complete electrical code parallel and separate instead of interlaced in such a way that they could not be distinguished. This separation simplifies their preparation, and also their administration, as in some cases administrative bodies concerned with one of the codes will not be concerned with the other.

Part 4 was first published in August, 1914, as Circular No. 49 of the Bureau, and after revision, with the coöperation of the Accident Prevention Committee of the National Electric Light Association, republished in May, 1915, as a second edition of that circular. The rules have been used by a large number of companies during the fifteen months since their second publication, and the present edition has been thoroughly revised in the light of considerable experience in actual use.

The other three parts of the Code were printed as Circular No. 54 of the Bureau, in April, 1915, and have been very thoroughly studied and developed since then. The complete code is now offered for careful study and use in practice, and the Bureau recommends that it be adopted at present only for use on trial. The Code will be revised in a year or so in the light of such experience, and may then be adopted more formally and made mandatory to a greater degree than would be reasonable at present.

Criticism of the rules contained in the Code and suggestions for their improvement, either by way of changes or additions, are invited. Before offering such criticism, however, the statement concerning the plan and scope of the code in the Introduction to Circular No. 54, second edition, should be read, as well as the discussions on the rules.

(*b*) As of interest in offering opportunity for the further coöperation of architects in the development of standards pertaining to some of those technical and structural problems with which the successful practice of the profession abounds, the following extracts from a letter to the Editor of the Structural Service Department from the Bureau of Standards are quoted.

"We should be very glad to have the expressed approval of the American Institute of Architects for the idea and general character of the National Electrical Safety Code and the indorsement of the Institute of the Bureau's proposal of giving this Code a thorough field trial in the immediate future with the coöperation of all the agencies concerned.

"In response to your inquiries as to such agencies as may be already utilizing the Safety Code, we may state that the State Commissions of Wisconsin, North Carolina, California, Pennsylvania, West Virginia, and Nevada now use the Safety Code in one form or another. New York City, through its Department of Water Supply, Gas and Electricity, is also making a trial use of the Safety Code in new construction. The Code has also been used as a basis by casualty insurance associations, and in particular by the National Workmen's Compensation Service Bureau operating in a number of states and with headquarters at New York City.

"Among those associations whose committees have for nearly three years been giving active coöperation in the preparation of the Safety Code, may be instanced the American Institute of Electrical Engineers, the National Electric Light Association, the American Electric Railway Association, the American Railways Association, the National Fire-Protection Association, and many others. These associations will, without exception, so we are advised, continue this coöperation and we should greatly appreciate coöperation by a similar committee of The American Institute of Architects, the possibility of which you have suggested. The interest of The American Institute of Architects in the safety of wiring installations is parallel with their interest in the prevention of electrical fires, and they have rendered great service in the past to the Electrical Committee of the National Fire Protection Association in the development of the National Electrical (Fire) Code.

"It has sometimes been proposed that a permanent advisory council drawn from the various national associations coöperating in the development of the National Electrical Safety Code and representative of all interests, including administrators and workmen as well as engineers, would be a desirable method of assuring the general correctness and satisfactoriness of future action in amending the National Electrical Safety Code. We should be glad to have an expression from The American Institute of Architects on the feasibility of such a plan. It is the hope that the continued coöperation of all interested in the Electrical Safety Code will insure its increasing adequacy and reasonableness and bring about its general adoption and use as against the adoption and use in different administrative jurisdictions of electrical safety rules separately arrived at by less extended local study or by the efforts of only a part of the interests concerned. The confusion which would necessarily result from such differing codes is apparent and would mean an unnecessary repetition of the confusion which existed as to electrical fire-prevention rules prior to the formulation and general adoption of the National Electrical (Fire) Code."

Signed, E. R. Rosa, for the Bureau of Standards.

Electricity Within and Around Buildings

6E Apparatus, Appliances and Installations in General

6E1 *Information Obtainable*

No attempt is here made to list the articles frequently appearing in the periodicals devoted to electrical subjects or in the bulletins, journals, or proceedings of Governmental Departments, professional or technical societies, or educational institutions, the indexes to the publications of all of which, including especially the American Institute of Electrical Engineers, The American Society of Mechanical Engineers and the National Fire Protection Association, should be consulted by those interested as well, also the list of publications of the U. S. Bureau of Standards.

See especially the subdivision 6L for description of the features included under this heading in the Mechanical Equipment of Federal Buildings.

(*a*) "Standard Handbook for Electrical Engineers," prepared by a staff of specialists, Frank F. Rowle, Editor-in-chief. 2000 pp. Fourth edition, revised, rewritten, and reset. The joint production of over 60 leading engineers; written for engineers in practice.

(*b*) "American Handbook for Electrical Engineers," Harold Pender, Editor-in-chief, and 26 Associate Editors. 2023 pp., fully illustrated. All phases of electrical engineering and related engineering subjects treated to meet everyday requirements of the practising engineer.

(*c*) "Electrical Engineers' Pocket Book," Horatio A. Foster, A.I.E.E., with the collaboration of other engineers and specialists. 1000 pp., illustrated. Useful data for electrical engineers, architects, and electricians.

(*d*) "American Electricians' Handbook," Terrell Croft. 711 pp., pocket size, illustrated. Does not go into design and gives only enough theory to explain why certain things should be done in certain ways.

(*e*) "Architects' and Builders' Pocket-Book," F. E. Kidder, pp. 1371–1399: "Electric Work for Buildings," W. H. Timbie. Contains a brief general treatise on electricity, machines, currents, fuses and circuit breakers, describes lighting systems, gives wire calculations, and offers general suggestions for electric work, conduit systems and specifications for interior wiring; illustrated.

(*f*) "Mechanical Engineers' Handbook," Lionel S. Marks, pp. 1566–1779: Section on Electrical Engineering by M. C. Beebe and F. A. Kartak, with tables and illustrations including wiring calculations and data on switches and fuses.

(*g*) "American Civil Engineers' Pocket Book," Mansfield Merriman, pp. 1310–1340: Section on Electricity.

(*h*) "Electrical Cost Data, Estimates and Working Tables," Horatio A. Foster.

(*j*) "Switchboards," Wm. Baxter, Jr. 192 pp., illustrated.

(*k*) "Cushing's Standard Wiring, 1916," H. C. Cushing, Jr. Based on the latest 1915 National Electric Code's Rules. Has special section devoted to house-wiring, and explains and illustrates the code. Contains tables and formulæ for inside and outside wiring.

(*l*) "Wiring of Finished Buildings," Terrell Croft, Consulting Electrical Engineer. 275 pp., illustrated. Combines both commercial and technical aspects. The technical end covers methods of wiring, tools, manipulation, fixtures, and gives examples of successful installations.

(*m*) "Electric Wiring, Diagrams and Switchboards," Newton Harrison. 272 pp., illustrated. A practical treatise, included in which is a development of a simple circuit with the position of mains, feeders and branches, their treatment as a part of a wiring plan and their employment in house-wiring.

(*n*) "Theatres and Motion Picture Houses," Arthur S. Melloy, Architect. 1916. 125 pp. Includes sections on Electric Wiring, Auditorium Lighting and Stage Lighting.

(*o*) "Universal Wiring Computer," Carl Hering. 44 pp., 4 charts. For determining the sizes of wires for incandescent electric lamp leads and for distribution in general without calculation, with some notes on wiring and a set of auxiliary tables.

(*p*) "Handbook of Electrical Methods," compiled from the *Electrical World*. 284 pp., illustrated. A collection of useful details that were contributed to the *Electrical World* in four years from the everyday experiences of the workers in the industry. It gives a vast amount of well-arranged information in comparatively small compass.

(*q*) "Alternating Current Wiring and Distribution," William L. Emmet. Second edition, 98 pp., illustrated. Contains the principles of alternating currents from the practical point of view, and of their distribution and application to lighting and power.

(*r*) "Electric Wiring Specifications," J. H. Montgomery, Professor of Physics and Electrical Engineering in the University of Southern California. 139 pp. A book from which a specification can be readily prepared which will cover all ordinary electrical work.

(*s*) "Electric Lighting Specifications," E. A. Merrill. 213 pp. For architects and engineers.

(*t*) "The Wiring Handbook," with 32 complete labor-saving tables and digest of underwriters' rules, by Cecil P. Poole. 85 pp., illustrated.

(*u*) "Building Estimators' Reference Book," Frank R. Walker, pp. 3300, 3301: Section on Electric-Wiring.

(*v*) "How to Check Electricity Bills," S. W. Borden. 55 pp., illustrated.

(*w*) "Mechanical Engineers' Pocket Book," William Kent, pp. 1396–1467, also pp. 713, 714 and 1420–1425 for electrical heaters, heating, and furnaces.

(*x*) See "Electrical Data," August, 1916. Published by Underwriters' Laboratories. 22 pp., illustrated. Contains: Announcement of Label Service for Cartridge-inclosed Fuses and Snap Switches; A Retrospect; Causes and Losses in Fires Due to Electricity; Rats and Lead-covered Cable; Fires and Accidents Due to Electrical Causes.

(*y*) In the "I.C.S. Electrical Engineers' Handbook" will be found much valuable information presented in a form useful to architects and engineers, comprising tables and sections on Electricity and Magnetism, Dynamos and Motors, Electric Lighting, Interior Wiring Power Transmission, and Operation and Maintenance of Electrical Apparatus. 414 pp.

(*z*) The above handbook is independent of 23 volumes on Electrical Engineering and allied subjects in the extensive International Library of Technology, each of which treats the subject exhaustively.

(*aa*) Read Reports of Committees printed in Proceedings of the American Society for Testing Materials (1A4*a*), 1916:
1. Committee B 1 on Copper Wire, p. 177.
2. Committee D 11 on Rubber Products.

(*bb*) Refer to the various publications mentioned under the Societies Associations and allied Agencies 6A1 to 6A9.

(*cc*) For information on electrical apparatus, installations and appliances in general, with notes, explanations and descriptions pertaining to the utilization of electrical energy in buildings and with references in many cases to the National Electrical Code, latest Underwriters' requirements, and other controlling factors. See pp. VII to XIII*b* of the General Electric Company, including Sprague Works, in the Industrial Section. This includes generators, switchboards, motors and other apparatus, conduits, wiring devices and other subjects listed in the special G-E Index on p. VIII.

(*dd*) For information concerning subjects under this heading, see the Industrial Section, p. VXIV. National Metal Moulding Co., "How to Write Conduit Specifications."

6E2 *Practice Recommended or Suggested by*

(*a*) U. S. Bureau of Standards:
1. See description of National Electrical Safety Code (6D11*a*).

(*b*) National Fire Protection Association (3A3):
1. See the "General Suggestions" which preface the National Electrical Code and which are printed in full under 6C1. Particular attention is called to the last two paragraphs recommending the general use of wire-ways for rendering concealed wiring permanently accessible (conduit systems) and urging architects when drawing plans and specifications to make provision for the channeling and pocketing of buildings for these and all other possible arteries for the utilization of electrical energy.
2. See "Field Practice," Inspection Manual of the N.F.P.A.; pp. 23, 31, 48, 77, and 75–77 for notes on the installation, care and maintenance of electric heating devices, irons, motors and power equipment, and other sections for explanations of the rules and requirements of various inspection departments of label service and of matters in general pertaining to good practice.

(*c*) National Board of Fire Underwriters (3A4):
1. From the "Building Code—1915" (3A4*d*1) the following is quoted in full from Section 261: "Electrical Installations—All electrical wiring, apparatus, or appliances for furnishing light, heat, or power shall be in accordance with the 'National Electrical Code,' and no installation of electrical equipment shall be made, except in conformity thereto."
2. In "Dwelling Houses" (3A4*d*3) the section relating to Electrical Installations is of exactly the same purport.

(*d*) American Society for Testing Material (1A4):
1. Tentative Standard Specifications for Insulated Wire and Cable, 30 per cent Hevea Rubber; Serial Designation D 27–16 T.

(*e*) Mechanical Equipment of Federal Buildings.
1. See the description of publication with this title given under 6L.

6E3 *Standards Adopted and Progress Reported*

(*a*) The National Electrical Code:

The Code (6C) comprehends the allowable approved methods for the manufacture of electrical apparatus and for the installation of conduits, wiring, switches, fixtures and devices carrying or consuming electricity in connection with buildings.

Where the Code is printed for the information of architects and building constructors, sections relating essentially to methods of manufacture are usually omitted.

It is presumed that such sections are complied with by reputable manufacturers and have become a precedent to their products being labeled by the Underwriters' Laboratories, which label is the architect's and user's evidence of compliance with the requirements of the Code.

It is of interest to note that the building codes of many of the larger cities make no mention of compliance with the Code or offer any other requirements which must be complied with in the wiring of buildings for electricity. There are few cities or towns where the electric light and power company will supply service to a building until a certificate of inspection of the wiring is secured from the local board of Underwriters or from the municipal electrical inspection department. Where there is a municipal inspection department, it is generally a violation of the city ordinance for the lighting company to provide service until such certificate has been obtained; in other cases there is an agreement with the lighting company not to connect to the building until the electrical work therein has been inspected and approved. It is also well known to the framers of codes that the furnishing of such a certificate is a requisite before fire insurance may be placed on any building, and that without such insurance mortgages cannot be negotiated or other financing of building construction be consummated. It would seem then that this system is practical, and it is taken for granted that it will be understood without the frank acknowledgement which one might expect to find in building codes of the procedure to be followed.

Specifications will invariably provide that the local requirements shall be met, for the same will be based upon the National Electrical Code, with such amplifications and variations as climatic and other conditions warrant.

(*b*) Standardizati on Rules of the American Institute of Electrical Engineers (see 6A1*d*):
In these particular effort has been directed toward defining in engineering terms the rating of electrical machinery and the requirements connoted thereby.

(*c*) International Standardization:
"It becomes impossible to carry standardization beyond a very elementary stage in any one country, without influencing the procedure in other countries. Coöperative relations have been entered into at different times between the A.I.E.E. Standards Committee and corresponding committees in other countries, to considerable mutual advantage, but especially through the influence of the International Electrotechnical Commission, an international body engaged in international electrical engineering standardization."

(*d*) "List of Inspected Electrical Appliances:"
(This list and a "List of Manufacturers of Inspected Mechanical Appliances;" also "List of appliances Inspected for accident Hazard" are published by Underwriters' Laboratories. Both lists are revised semi-annually.) See 1B2*a*, 3A6.
"Products labeled or listed as mentioned above are not necessarily uniform in quality or merit, the labeling and listing indicating only compliance with Underwriters' requirements."

(*e*) "Electric Light and Power Equipments—Rules:
"Approved Electrical Fittings" (subject to semi-annual revision):
(These two publications are issued by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies.) See 3A7.
"The 'List of Approved Electrical Fittings' is designed to enable mill managers and electrical contractors to quickly learn where thoroughly reliable fittings can be obtained. This pamphlet forms a supplement to 'Rules for Installing Electric Light and Power Equipments,' which should be carefully followed in all electrical construction work."

(*f*) "Universal Safety Standards:" A reference book of Rules, Drawings, Tables, Formulæ, Data and Suggestions for use of Architects, Engineers, Superintendents, Foremen, Inspectors, Mechanics and Students, by Carl M. Hansen, M.E., Consulting Safety Engineer, Member American Society Mechanical Engineers. Compiled under the direction of and approved by the Workmen's Compensation Service Bureau, New York City.

(*g*) See also "Electrical Edition" of same.

(*f*) and (*g*) contain diagrams and descriptions of guards for motors, switchboards, starting panels, controllers, fuse-boxes, and other safety devices.

(*h*) The American Society for Testing Materials has adopted the following:
1. Standard specifications for Hard-Drawn Copper Wire, Serial Designation B 1–15.
2. Standard Specifications for Medium Hard-Drawn Copper Wire, Serial Designation B 2–15.
3. Standard Specifications for Soft or Annealed Copper Wire, Serial Designation B 3–15.
4. And others relating to cables, trolley wires, and specialized products.

(*j*) U. S. Bureau of Standards:
1. See Circular No. 31, "Copper Wire Tables," referred to under 6E3*b*.
2. The Bureau is coöperating with a number of testing laboratories identified with the American Society for Testing Materials in investigating the merits of an accelerated heat-test as applied to rubber insulation on wire. The object of the work is to determine the relative effect of dry heat 160° F., as compared with the effect of natural aging under uniform atmospheric conditions. This investigation is in line with a similar work that has been in progress at the Bureau for several years, in which the relative effect of dry heat, as compared with natural aging, has been studied in the case of fifty-five rubber compounds.
3. Some of these results appear in the third edition of Bureau of Standards Circular No. 38, "Testing of Mechanical Rubber Goods."

6E4 Standard Symbols and Charts

(*a*) See Standard Symbols for Wiring Plans, as adopted by the National Electrical Contractors' Association of the U. S. and the American Institute of Architects, mentioned under 6A4*a*. In addition to the copies on cardboard, which may be had as there mentioned, these Symbols may be seen illustrated and explained in:
1. "Kidder's Pocket Book—1916," pp. 1398–1399.
2. "Sweet's Architectural Catalogue—1917," p. 1423.
3. "Portfolio of the Architectural Service Corporation," Service Sheet No. 1, January, 1916.

(*b*) Standard Conduit Charts, showing standard sizes of conduits for the installation of wires and cables, adopted and recommended by the National Electrical Contractors' Association of the U. S. and required by the National Electrical Code, may be obtained as mentioned under 6B2*b*.

6F Electric Elevators and Dumbwaiters

Complete descriptions will be found in some, and a very considerable amount of valuable data in others, of the publications mentioned below:

See especially the Chapter on "Elevators" from "Mechanical Equipment of Federal Buildings" described under 6L.

1. "Standard Handbook for Electrical Engineers," Frank F. Fowle: Section on "Electric Elevators," by D. L. Lindquist, Chief Engineer Otis Elevator Co., and Asso. A.I.E.E.
2. "Mechanical Engineers' Handbook," Lionel S. Marks: Section 9 treats of "Hoisting and Conveying," by C. Kemble Baldwin, pp. 1006–1187.
3. "American Handbook for Electrical Engineers," Harold Pender: Section on "Electric Elevators."
4. "Architects' & Builders' Pocket Book," F. E. Kidder: Section on "Elevator-Service in Buildings," pp. 1579–1597, contains information on electric elevators and gives valuable data for calculating the number of elevators required, determining sizes, etc. —similar to that mentioned under JL1*h*.
5. "Electrical Engineers' Pocket Book," Horatio A. Foster: Section on "Electric Elevators."
6. "Mechanical Engineers' Pocket Book," Wm. Kent: Section on "Hoisting and Conveying," pp. 1181–1218.
7. "Building Estimators' Reference Book," Frank R. Walker: Chapter XXII on "Miscellaneous Building Specialities," pp. 2900–2906, gives information on Cost of Electric Passenger Elevators, Electric Freight Elevators, Cost of Cars and Dumbwaiters.
8. "Elevator Shaft Construction: Practical Suggestions for the Installation of Elevators in Buildings," H. R. Cullmer and A. Bauer.
9. "Universal Safety Standards" (described under 6E3*f*) shows safety devices, controls, guards, hatchways and entrances, automatic trap-doors and gates, platforms and guards for sheaves and for safe installations in general.
10. The codes of cities or ordinances regulating elevator construction will also afford specificational requirements. Valuable suggestions will be found in catalogues and other literature of manufacturers.
11. For specific information pertaining to the installation of electric elevators, see pages in the Industrial Section as follows:
(*a*) Otis Elevator Co., p. xx–xxi.
(*b*) A. B. See Electric Elevator Co., pp. xvi–xvii.
12. For specific data, illustrations and detailed drawings pertaining to an Elevator Signal System, see Wakefield & McNabb, pp. xxii–xxiii, in the Industrial Section.
13. For information relating to dumbwaiters (hand-power), see Industrial Section, p. xxviii, Sedgwick Machine Works.

6G Telephones, Signaling Systems, Clocks and Bells

Attention is again directed to the necessity of providing in all buildings such chases, channels, pipe-ducts, or runways as will adequately meet all needs for installing arteries of service, not only for present requirements, but allowing also for reasonable future needs and the possibility of installations not now thought of.

1. The two following paragraphs are again quoted from the National Electrical Code:
(*a*) "The use of wire-ways for rendering concealed wiring permanently accessible is most heartily endorsed and recommended; and this method of accessible concealed construction is advised for general use."

(*b*) "Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires, and also for telephone, district messenger, and other signaling system wiring."

2. "Telephone Construction, Installation, Wiring, Operating and Maintenance," W. H. Radcliffe and H. C. Cushing, Jr. 223 pp., illustrated. Intended for electricians, wiremen, engineers, architects, contractors and others interested in the installation of telephone exchanges in accordance with standard practice.
3. "Architects' & Builders' Pocket Book," F. E. Kidder: Section on "Interphones and Automatic Telephones for Intercommunicating Service," pp. 1627–1628.
4. "American Handbook for Electrical Engineers," Harold Pender: Section on "Telephone Instruments and Circuits," pp. 1530–1550.
5. "Standard Handbook for Electrical Engineers," Frank F. Fowle: Section on "Telephony, Telegraphy, and Radio-telegraphy."
6. "Electrical Engineers' Pocket Book," Horatio A. Foster: Section on "Telephony."
7. "American Telephone Practice," Kempster B. Miller. 904 pp., illustrated.
8. "American Civil Engineers' Pocket Book," Mansfield Merriman: Section 14, Article 19, p. 1339. Information on open-circuit batteries for use on intermittent service, such as call bells and short telephone lines.
9. "Fire Prevention and Fire Protection," J. K. Freitag: Chapter XXXI, "Automatic Fire Alarms, and Sprinkler Alarm and Supervisory Systems," pp. 908–921; also Chapter XXXIII, "Watchmen, Watch-Clocks and Manuals," pp. 944–958.
10. "Crosby-Fiske Handbook of Fire Protection," Fifth Edition (Sixth Edition now in preparation): Section on "Signaling Systems and Watchman Service," pp. 250–269.
11. "Field Practice," Inspection Manual of the N.F.P.A. Information on signaling systems, pp. 179–182.
12. "I.C.S. Telephone and Telegraph Engineers' Handbook." Contains useful tables, and sections on Telephone and Telegraph Systems, Location of Faults, Electricity, Magnetism, Electrical Measurements, and Batteries. 398 pp.
13. See the "I.C.S. Electrical Engineers' Handbook" (6E1*y*) for information on signal-bell circuits, pp. 369–371.
14. Along the lines of the recommendations contained under 6G1*a* and *b*, above referred to, it should be noted that the N.E.C. does not prescribe the sizes for conduits for signal systems and that the wires permitted by the telephone companies of various cities differ as to thickness of insulation. The Chart (described under 6E4*b*) therefore represents wires with both light and heavy insulation and shows conduit sizes accordingly.
15. See "Mechanical Equipment of Federal Buildings" 6L1*f*.
16. Some telephone companies insert notices similar to the following in their directories: "Adequate facilities for handling telephone wires and cables in new buildings will mean the most satisfactory telephone service for the tenants. Satisfied tenants are an asset to the owner of a building. The Telephone Company asks the coöperation of the architects. When designing new buildings, call the Plant Engineer."
17. The New York Telephone Company states that of the two ways to wire an apartment house—conduit system or wires in a molding—the conduit layout is now generally preferred. For further information on the subject by this company, see Industrial Section, p. xiii.
18. For Elevator Signal Systems, see Industrial Section, pp. xxii–xxiii, Wakefield & McNabb Co.
19. Standard of Telephone Service:
    Preliminary studies have been undertaken to ascertain to what extent the different grades of telephone service required under different conditions can be adequately described in series of standard service specifications. Detailed studies under actual operating conditions, and under the manifold variations encountered in different localities, are necessary before it will be possible for the Bureau of Standards to suggest suitable service standards for telephony similar to those already proposed for gas and electric light and power supply. Such detailed coöperative studies in this and other lines are necessary before public utility commissions can regulate telephone utilities with full justice to all interests concerned. From Report of Bureau of Standards, 1916.

6H Illumination, Lighting Fixtures and Lamps

Most of the publications which follow treat of illumination by gas as well as electricity, and cross-reference to same will be made under the next Serial Number (7) when those which treat especially of gas will be separately referred to. In that number also will appear a description of the Illuminating Engineering Society.

6H1 *Information Obtainable*

(*a*) "The Art of Illumination," Louis Bell, Ph.D. 353 pp., illustrated. Dr. Bell's treatise was the pioneer book on illumination. The new edition, entirely rewritten, is designed primarily for the use of illuminating engineers.

(*b*) "Radiation, Light and Illumination," Charles P. Steinmetz, Ph.D. 305 pp., illustrated. It covers illuminating engineering fully, and will appeal strongly to the illuminating engineer and to the architect as well.

(*c*) "Factory Lighting," Clarence E. Clewell, Assistant Professor of Electrical Engineering, University of Pennsylvania; formerly Lighting Expert, Westinghouse Co. 160 pp., illustrated. Tells in a simple way how to obtain good lighting by analyzing actual installations, and gives illustrations to show good and bad lighting in shops, drafting-rooms, offices, power-houses, etc.

(*d*) "Illumination and Photometry," William E. Wickenden, Assistant Professor of Electrical Engineering, Massachusetts Institute of Technology. 195 pp., fully illustrated. An investigation of the scientific principles of illumination. Subject treated in a condensed way, but always with emphasis upon the principles.

(*e*) "Practical Illumination," J. R. Cravath and V. R. Lansing. 356 pp., illustrated. Gives suggestions and specific data showing the application of the broad general principles underlying the design of artificial illumination for everyday use in all kinds of buildings.

(*f*) "Architects' & Builders' Pocket Book," F. E. Kidder: Section on "Lighting and Illumination of Buildings," by W. H. Timbie, pp. 1351–1370.

(*g*) "Mechanical Engineers' Handbook," Lionel S. Marks: Section 11 contains a chapter by Louis Bell on "Illumination;" treats of Computation of Illumination, Practical Sources of Light, and Methods of Lighting; pp. 1366–1381.

(*h*) "American Civil Engineers' Pocket Book," Mansfield Merriman: Section 14, Article 18, pp. 1335–1338, gives information on "Electric Lighting and Illumination."

(*i*) "Mechanical Engineers' Pocket Book," Wm. Kent: Section on "Illumination," pp. 1,468–1,477.

(*k*) "Standard Handbook for Electrical Engineers," Frank F. Fowle: Section on "Illumination."

(*l*) "American Handbook for Electrical Engineers," Harold Pender: Section on "Illumination," pp. 756–763.

(*m*) "American Electrician's Handbook," Terrell Croft: Illustrated section on "Illumination."

(*n*) "Crosby-Fiske Handbook of Fire Protection," (sixth edition now in preparation). Information on "Lighting by Electricity," in fifth edition, pp. 120–122.

(*o*) See Section on "Illumination" in "Electric Light Wiring," C. E. Knox. 225 pp., illustrated.

(*p*) See "Electric Lighting Specifications," E. A. Merrill. 213 pp. For architects and engineers.

(*q*) See "Theatres and Motion Picture Houses," Arthur S. Melloy, Architect. 1916. 125 pp. Includes sections on "Auditorium Lighting" and "Stage Lighting."

(*r*) "Color and Its Applications," by M. Luckeish.

(*s*) "Light and Shade and Its Applications," M. Luckeish.

(*t*) Consult the list of publications issued by the U. S. Bureau of Standards for Bulletins bearing on this subject.

(*u*) See the pamphlet entitled "Light—Its Use and Misuse," published by the Illuminating Engineering Society (Serial No. 7).

(*v*) See also the periodical of the I.E.S. called the "Transactions," in which are printed papers dealing with all phases of the art and science of illumination.

(*w*) See the "I.C.S. Electrical Engineers' Handbook" (6E1*y*) for information on Illumination and Lamps.

(*x*) For general information on illumination with reference to exterior and interior lighting units of the General Electric Company and of its Ivanhoe-Regent and Edison Lamp Works, and to Mazda lamps, see p. xii*a* of the G-E Company, this issue. Also the G-E Index.

(*y*) For Types of Lighting, Terms Used, Measurement of Lighting and Method of Determining Quantity of Light with a Table of the Average Practice in this Regard, see "Electrical Information and Data" furnished by the Society for Electrical Development, Inc., and printed in "Sweet's Architectural Catalogue," 1916, pp. 1316–1318.

(*z*) For further information regarding lighting fixtures, see pages in the Industrial Section, of The Mitchell Vance Co., Inc., Vancebronze, the new metal, p. xviii.

6H2 *Practice Recommended and Standards Adopted*

(*a*) Refer to appropriate sections of National Electrical Code (N.F.P.A.) and National Electrical Safety Code (U. S. Bureau of Standards).

(*b*) See "Field Practice" (N.F.P.A.), 3A3*d*1, sections on "Lighting Hazards—Electricity," pp. 21–23 and 130.

(*c*) See "Code of Lighting: Factories, Mills and other Work Places," prepared by committees of the Illuminating Engineering Society and issued under the direction of the Society (to be described in Serial No. 7). Copyright 1915. 45 pp., with half-tone illustrations, plans, sections and other diagrams. Treats of daylight requirements as well as of artificial illumination. "While the code is intended as an aid to industrial commissions and other similar bodies in those states and municipalities which shall actively take up the questions of legislation as related to factory and mill lighting, it is intended in equal measure for the industries themselves as a practical working guide in individual efforts to improve lighting conditions. The language of the code has not been drafted according to legal phraseology but is simple and pointed throughout, thus being readily available for transforming into legal orders, and at the same time as a working guide in practical design and installation work."

(*d*) See reports of various committees of the Illuminating Engineering Society.

(*e*) Consult, in Associated Engineering Societies' Library, publications of the National Electric Light Association, such as those of the Lighting Sales Bureau, Reports of Subcommittee on Industrial and Yard Lighting, on residential lighting, and on other lighting problems. Illustrated with diagrams of buildings and plates showing installations, lighting fixtures and other essentials.

(*f*) See "List of Inspected Electrical Appliances" (6E3*d*). See also 6A and Industrial Section, p. xix.

(*g*) See "Approved Electrical Fittings" (6E3*e*).

(*h*) For "Standard Symbols" indicating number and kind of lights to wiring outlets and methods of control, see description under 6E4.

(*j*) For valuable data and suggestions on illumination and the wiring to accomplish same, see "Mechanical Equipment of Federal Buildings" as described under 6L1*f* and 6L1*g*.

6H3 *Life Testing of Incandescent Lamps*

The lamps purchased by the Federal Government, amounting to about 1,250,000 annually, are inspected and tested by the Bureau of Standards. The specifications under which these lamps are tested are published by the Bureau and are recognized as standard by the manufacturers as well as by the Government. They are used also by many other purchasers of lamps.

The lamps are first inspected for mechanical and physical defects, this being done at the factory by Bureau inspectors. Representative samples are selected and sent to the Bureau, where they are burned on life test at a specified efficiency, at which they must give a certain number of hours' life, depending upon the kind of lamp. From 3,000 to 5,000 lamps are thus burned on test each year.

Scientific Paper No. 265 gives a complete description of the special apparatus and of the methods used in these inspections and tests.—From Report of the Bureau of Standards, 1916.

6J Heating, Cooking and Other Appliances and Devices

1. These various appliances and devices pertaining to the comfort and convenience of occupants of hotels, apartment houses, office buildings, residences, and other structures are treated in but very few of the Electrical handbooks and other such publications.

Some will occasionally be found by looking in the index of publications referred to, but so rapidly is development taking place in their manufacture and utilization that the chief source of information to be had concerning them is through catalogues and other literature of the manufacturers themselves.

(*a*) Some notes and suggestions on various devices will be found in Useful Information for architects, contractors and engineers referred to under 6A2 and elsewhere.

(*b*) For a list of many such devices of the latest type and for publications pertaining to them see the General Electric Company's presentation in the Industrial Section, pp. xi–xii.

6K Vacuum Cleaners

1. This important modern development in building sanitation will also not be found treated in many of the handbooks elsewhere listed though the operating and controlling features of so many of these systems, whether stationary or portable, are of interest electrically. For this reason the subject is treated in this issue, although vacuum systems will be again mentioned in a later Serial Number.

Included in standard handbooks, the subject has been found treated in:

(*a*) Kidder's "Architects' & Builders' Pocket Book," 1916. See "Vacuum Cleaning," pp. 1628, 1629.

(*b*) For a complete treatise on the whole subject, including a highly interesting historical review of the development of the Vacuum Cleaner, see "Vacuum Cleaner Systems," by M. S. Cooley, Mechanical Engineer in office of the Supervising Architect, Treasury Department. Copyright 1913 by Heating and Ventilating Magazine Company of New York. 232 pp., completely illustrated.

This states the requirements of an ideal system and gives descriptions and diagrams of all mechanical and electrical parts of various systems, including the pipe and fittings, controlling appliances and tools.

It gives data on the selection of various types, methods of testing and Specifications for five classes of plants.

It also describes portable vacuum cleaners, including those for attachment to lighting systems.

(*c*) See Chapter on "Vacuum Cleaning Systems" described under 6L1*l*.

(*d*) For information on Arco-wand Vacuum Cleaners, see Industrial Section, p. xv, American Radiator Company, and for detailed drawings of the mechanism and further data pertaining to this system, see "The Ideal Fitter," edition of May 1, 1916, pp. 281–286.

6L Mechanical Equipment of Federal Buildings

1. A subdivision is given to this subject in order to mention and briefly describe a publication with which all architects should be familiar, in connection with the mechanical equipment in buildings, other than residences, whether or not the same are installed in coöperation with consulting engineers.

This refers to "Mechanical Equipment of Federal Buildings under the control of the Treasury Department," by Nelson S. Thompson, Chief Mechanical and Electrical Engineer, Office Supervising Architect, Treasury Department, Washington, D. C.

The subjects treated are as follows:

(*a*) Chapter I. Heating and Ventilation.

(*b*) Chapter II. Commercial Practice in Regard to Heating Factory and Other Buildings.

(*c*) Chapter III. Commercial Practice in Regard to Heating by Forced Circulation of Hot Water from a Central Station.
(These will be described in the issue of the Journal devoted to Heating and Ventilation.)

(*d*) Chapter IV. Plumbing, Drainage and Water-Supply.
(Will be described in Plumbing issue.)

(*e*) Chapter V. Gas Piping.
(Will be described in next issue.)

(*f*) Chapter VI. Conduit and Wiring Systems.
This gives the standard arrangement for electric installations in Federal buildings, including underground service, switchboards, distribution tablets, table of conduit sizes for conductors, and of lead-encased cable in unlined metallic conduit, describes outlets and standard wiring for lighting, gives wiring formulæ and tables, gives data on illumination with tables of effective lumens for different lamps and reflectors, and estimating data on electrical appliances.
It also includes conduit systems for time-clocks and other special purposes, also town clocks, fire alarm and watchman's time-detector systems, vault-protection systems, telephone and call-bell conduits, and conduits for signal systems.

(*g*) Chapter VII. Lighting Fixtures.
This gives "Basic Data in Connection with Design and Installation of Lighting Fixtures" and data for estimating the cost of same. It also includes a "typical lighting fixture speci-

fication prepared by the office" which covers various types of fixtures, glassware, reflectors, metals and finish, switches, and gives a schedule of fixture and notes on inspection and tests.

(*h*) Chapter VIII. Elevators.

This gives data of the utmost importance to architects, especially in the preliminary study necessary to reach a decision upon the number, type and speed of elevators for all kinds of structures.

With the aid of individual experience and judgment, a close approximation of the number of elevators and of the size of each which should be installed in a given building may be based on the facts in regard to elevator service in this chapter which are stated by Mr. R. P. Bolton, consulting engineer, of New York, in his treatise entitled "Elevator Service."

It also gives data to determine the loads to be carried and space requirements, and states recommendations as to various forms of equipment, concluding with a "Specification for the standard tandem worm geared electric passenger elevator with direct current motor and full magnet control such as is installed by the office of the supervising architect," and a supplementary specification for "Alternating Current Elevators," following which is "Instructions Relative to the Inspection and Test of New Elevators."

(*j*) Chapter IX. Small Power Plants.

This is prepared with special reference to installations in Federal buildings under control of the Treasury Department and states all items which require consideration in determining whether the mechanical equipment should include a power plant for the generation of electric current for light and power.

It discusses types of engines and electric generators, gives tables and includes "A specification for Engines and Generators as prepared in the office of the Supervising Architect."

(*k*) Chapter X. Motors and Controlling Apparatus.

Discusses direct and alternating current motors and gives various recommendations.

(*l*) Chapter XI. Vacuum Cleaning Systems.

This contains data on stationary systems of both the so-called high-vacuum and low-vacuum types and gives tables for determining the sizes of plants and recommendations for installation. It also includes a complete, "Specification such as is used by the office of the Supervising Architect for a Four-sweeper Plant," included in which is a description of the electric motor and its automatic control.

(*m*) Chapter XII. Operating Data.

This gives calculations of cost of operating mechanical equipments with sample reports of those made in certain Federal buildings and includes a discussion of the isolated plant versus the central station as regards heat as well as electric current.

Appendix.

(*n*) General Instructions, issued to draftsmen by the Chief Mechanical and Electrical Engineer, Office Supervising Architect.

This could well be read by all practising architects as it contains eleven pages of valuable suggestions which could be followed in the case of any building, taking up as it does the procedure followed in an office from the inception of a building project to its conclusion. It not only treats of surveys and data to be obtained concerning the site, its surroundings and public utilities, but contains many calculations for determining quantities cost and space requirements with respect to all features of mechanical equipment and building construction affected. It contains also recommendations as to procedure and gives departmental requirements about which it is well to be informed.

(*o*) Suggestions to Superintendents.

These are a natural complement of and extensions to the General Instructions to Draughtsmen just referred to.

(*p*) Miscellaneous Data.

Consists of tables such as Capacity of Cylindrical Tanks and many others of much usefulness.

6L2

In this subdivision it is also desired to call attention to the Journal of the Society of Constructors of Federal Buildings (2A4*a*). In various numbers of this publication will be found contributions of interest to architects, engineers, and constructors on electrical installations and other matters pertaining to the mechanical equipment as well as the construction of buildings.

6M Lightning Protection

(For data see April Journal, Serial No. 4G.)

6N Electrolysis

References to this subject will be found in many of the publications elsewhere referred to; also under "Experiment and Practice" in Trautwine's Civil Engineers' Pocket Book, pp. 1168, 1182. See, also, the following publications of the U. S. Bureau of Standards:

Technologic Paper No. 28, "Methods of Making Electrolysis Surveys;" Technologic Paper No. 54, "A Report on Conditions in Springfield, Ohio, with Insulated Feeder System Installed;" Technologic Paper No. 55, "A Preliminary Report on Electrolysis Mitigation in Elyria, Ohio;" Technologic Paper No. 62, "Modern Practice in the Construction and Maintenance of Rail Joints and Bonds in Electric Railways;" Technologic Paper No. 63, "Leakage of Current from Railways;" and Technologic Paper No. 75, "Some Instances of Track Leakage."

The following extracts from the Report of the Bureau of Standards, 1916, will be found of interest.

"When considering the enormous value of the pipe and cable properties buried in the streets of cities and forming in many cases transmission networks between cities throughout the country, and when considering further that there are very few water, gas, or lead cable systems which are not more or less subject at some points to electrolytic damage from stray currents, it is possible to better form a judgment of the practical importance of this subject which still does not receive in many quarters the attention that its importance deserves.

The water- and gas-pipe systems of this country alone have an aggregate value at the present time of approximately $1,500,000,000, and in addition to this there is a vast extent of underground lead-cable systems belonging to telephone and electric power companies and to municipalities, a considerable part of which may be more or less subject to electrolytic damage. There are also possibilities of trouble in the case of bridge structures, portions of steel frame buildings, and piers, which are occasionally exposed to damage from this source. While it is impossible at present to determine with any accuracy the extent of the damage to pipe systems by electrolysis, nevertheless, the most conservative estimates place it at many millions of dollars annually.

The Bureau has been studying the electrolysis question for the past six years and has done a large amount of work in connection with it. The first problem investigated was that concerning the effects of electrolysis in reinforced concrete, after which special attention was given to electrolysis of underground pipes. This has included laboratory investigations concerning the effects of electric current on concrete and on metal pipes, tests of pipe-coverings, the corrosion of metals in the soil, methods of measuring soil resistance, and various other experimental phases of the work; methods of electrolysis mitigation that have been used or proposed; field studies in actual practice with the application of remedies; and a determination of the cost and results obtained.

GENERAL ELECTRIC COMPANY

G-E—Its Service to Architects and Engineers and Its Relation to the Electrical Features of Building Construction

The General Electric Company welcomes this opportunity to present in the Electric Issue of the Journal of the American Institute of Architects an outline description of its organization, manufacturing facilities, output and service, and to express its desire to coöperate with architects in perfecting and maintaining a uniform standard of excellence in the electrical installation and equipment of all buildings.

G-E INDEX TO SUBJECTS TREATED AND TO PUBLICATIONS REFERRED TO

G-E1 Resources and Unified Responsibility.

G-E2 Suggestions for Specifying Electrical Equipment.

G-E3 Universality of Production and Use.

G-E4 Sources of Energy—Electrical Apparatus.

Publications:	G-E Bulletins
Steam Turbines	42206, 42201
Steam-Driven Generator	40500
Belt-Driven Generator	40400
Gas-Driven Generator	42400

G-E5 Control and Distribution.

Publications:	G-E Bulletins
Switchboards	"Standard Units" B-3303
Circuit Breakers	47502, 47503
Electrical Instruments	46013
Electrical Meters	42691, 46253, 46203

G-E6 Power Appliances—Electric Motors.

Publications:	G-E Bulletins
Induction Motors	41302
Direct Current Motors (constant speed)	41013
Direct Current Motors (variable speed)	A-4130
Direct Current Motors (crane and hoist)	48108

G-E7 Transmission—Wiring and Conduit Data.

Publications,* also
Sprague Bulletin 49600
Sprague Pamphlets 117
Various Sprague Folders

G-E8 Local Centers of Distribution—Panel Boards and Cabinets.

Publications,* also Sprague Special Pamphlet, "Safety Panels"

G-E9 Switches for Every Use.

Publications: See Supply Catalogue, Remote Control Switches, G-E Bulletin A-4070

G-E10 Sockets and Receptacles.

Publications: See Supply Catalogue

G-E11 Utilization of Electrical Energy—Cooking and Heating.

Publications:	G-E Bulletins
Ranges, Domestic	B-3353
Disk Stoves, Domestic	B-3410
Radiant Grill, Domestic Table	B-3278
Ranges, Hotel	Y-898
Broiler, Hotel	Y-898
Ovens, Hotel	Y-898
Toaster, Hotel	Y-898
Air Heaters, Domestic	B-3423
Luminous Radiator	B-3329
Irons, Flat, Domestic	B-3318
Irons, Flat, Tailors'	B-3394

G-E12 Hotel Equipment.

Publications*

G-E13 Special Transformers.

Publications:	G-E Bulletins
Night Lamp	B-3341
Bell Ringing Systems	B-3400

G-E14 Fans.

Publications:	G-E Bulletins
Desk Fans	B-3367
G-E Ventilating Outfits*	

G-E15 Battery Charging Outfits.

Publications: G-E Bulletin B-3374

G-E16 Moving Picture Apparatus.

Publications*

G-E17 Illumination.

Publications:
Flood Lighting Projectors. G-E Bulletin 43850. Novalux Ornamental Units, 43503.
Ivanhoe-Regent catalogues and pamphlets.
Bulletins of Edison Lamp Works of the G-E Company.

G-E18 Generation, Transmission, Distribution and Application of Electric Power Everywhere.

*Information may be obtained at our nearest office. See page xii*b*.

G-E1 Resources and Unified Responsibility

The factory, engineering and laboratory equipment of the General Electric Company is practically unlimited. Therefore, it is able to manufacture complete lines of apparatus, appliances and devices which possess the important features of uniformity and interchangeability to a degree possible only in the products of a single large manufacturer.

(*A*) *Organization*

The organization of the General Electric Company comprises subsidiary corporations specializing in all features of installation equipment that make it possible for G-E products to be adopted from the source of electrical energy to its fullest utilization within and without any type of building, monumental, industrial, or residential.

(*B*) *Standardized G-E Equipment*

It is entirely practical, therefore, for the architect to standardize with G-E equipment throughout. By this procedure all parts interrelate and much time and annoyance can be saved. The added advantage of having all electrical equipment provided by one company, ready for immediate installation and operation is obvious.

G-E2 Suggestions for Specifying Electrical Equipment

We believe that the sequence of presentation hereafter followed, the descriptions given, and the publications listed, will, with the known reliability of all G-E products and service, so impress architects that they may feel warranted in considering a paragraph similar to the following as most appropriate for inclusion in their specifications:

Wherever makes or names are mentioned in this specification for generators, switchboards, motors, wiring, conduits, fittings, switches, receptacles and all other electrical appliances or devices, and any alternative choice is provided, it is to be understood that preference will be given to that estimate, not necessarily the lowest, which proposes to incorporate in the contract and the building the greatest number of fixtures, fittings, and materials of a standardized line from one manufacturer under recognized names fully indentifiable on every piece or part of the equipment.

This suggestion is made with the full consciousness of the fact that no other maker can so fully meet the conditions, under all usual circumstances, as the General Electric Company and in the belief that the greater the quantity of materials of one reputable manufacturer which is installed under any one contract the greater is the responsibility of manufacturer and contractor on the one hand and the better served are the interests of both architect and owner on the other hand.

G-E3 Universality of Production and Use

The products of the General Electric Company comprise practically every kind of apparatus and machinery used in the generation, transmission, distribution, and use of electrical energy. Its thousands of products, in use in all parts of the world, have established the G-E Trade Mark as the Guarantee of Excellence on Goods Electrical. As in the past the General Electric Company will continue to be foremost in all developments and improvements tending toward the perfection of present electrical service and its extension into new fields of usefulness.

(*A*) *Engineering and Sales Departments*

For the convenience and use by architects, engineers, and the consuming public, in the coöperative development of a universal service and the highest standards of efficiency for both original installation and upkeep, the G-E Company has established a complete chain of sales offices which are listed on last page. These departments and the engineering staff are prepared to assist architects and engineers in any way desired in the planning, selection, and use of apparatus, materials, and devices most appropriate to each demand of service and to all climates, inspection and code requirements to which reference will be found under the various subdivisions.

(*B*) *Publications and Informative Data*

The G-E Company issues a complete series of publications, in the form of Bulletins and Supply Catalogues, which are available to all architects and engineers. A list of those current is printed in connection with the Index for their convenience, and reference to these is made under the various subdivisions.

In addition to these certain tables of capacities and dimensions, space requirements, and other data pertaining to general requirements will be found in the G-E pages of Sweet's Architectural Catalogue (pp. 1425–1439 in 1917 edition) and recommendations, notes, and formulæ of interest will be found in electrical information and data furnished by The Society for Electrical Development, Inc., also printed therein and referred to under 6A2 and elsewhere in this issue of The Journal. See also pages in Sweet's of Sprague Electric Works (1440) and of Ivanhoe-Regent Works (1466–1467).

It is a well recognized fact that a knowledge of the many functions which electricity performs in modern building practice is necessary to every architect. In this

outline description of G-E facilities and service, the methods of obtaining electric power, controlling it, and applying it to various uses are described and illustrated with concrete suggestions which will aid in the preparation of electrical specifications for building construction. Complete detailed information will be found in the various G-E publications of interest structurally, under the G-E Index on p. VIII.

G-E4 Sources of Energy—Electrical Apparatus

In designing an electrical installation it is essential to determine in advance whether central station current will be used or a complete power plant is to be installed. When central station current is available, it is generally conceded to be more economical, except in special cases, to use such power than to install a generating plant. In the latter case it is recommended that the current generated shall correspond to the class of current obtainable from the public service company, for in case of a breakdown of generating plant, central station power will be suitable, and there will be no occasion for interruption of service.

In any case, it is wise to consult with the central station management, as they are always familiar with the latest regulations affecting the industry, both those of the local city administration and of the local underwriters' inspection department. It is advisable also to confer with the latter authorities, the territorial jurisdictions of which are stated under 6A6.

As a rule, alternating current is used when transmission is over one-quarter mile, and where constant speed and constant service are required, and whenever lighting systems are the principal load. In buildings where stopping and starting of various machines will be frequent, and where a large number of adjustable speed motors are desired, or battery charging or electroplating is required, direct current is best adapted.

(*A*) *Where Central Station Power is Available*

When power is purchased from a lighting or power company it is possible to connect incoming wires direct to switchboard. Suitable switchboard panels with main switch and meters for measuring current should be specified when ordering switchboard. When incoming current is not suitable for requirements, it will be necessary to change the form of the current to meet these conditions by using motor generator sets, rotary converters, transformers, or mercury arc rectifiers. Whenever such conditions are encountered, it is advisable to get in touch with the nearest G-E office which will gladly give detailed information.

For power stations supplying electric light and power to office buildings, machine shops, mills, etc., the Curtis steam turbines are admirably adapted for this class of work. Their operation is characterized by a minimum of vibration and noise. They are very compact, requiring minimum floor-space, headroom and attendance. The exhaust steam is free from oil and may be used for heating.

Turbine sets are available in sizes ranging from 100 kw. to 50,000 kw. for alternating current, and from 15 kw. to any larger for direct current.

Publications:	G-E Bulletins
Steam Turbines	42206, 42201
Steam-Driven Generator	40500
Belt-Driven Generator	40400

(*B*) *Where Steam Power is Available*

When central station service is not available for small isolated plants requiring 100 kw. or less, the steam engine generating set is used. These sets were designed originally to meet the severe conditions of marine work, which demand light, compact, and durable sets of close regulation and quiet operation. These sets have been used extensively for both power and lighting service.

When it is desired to provide for taking power from an outside source in case of emergency, double-throw switches may be added to main panel of the switchboard equipment.

For the production of electrical energy from mechanical sources of power, belt-driven generators are used. Such units are available in sizes up to 300 kw. for direct current and up to 500 kw. for alternating current.

Publications:	G-E Bulletins
Steam Turbines	42206, 42201
Steam-Driven Generator	40500, A4189
Belt-Driven Generator	40400

(*C*) *Where No Power is Available*

For rural residences, hotels, farms, country estates, rural railroad stations, camps, etc., electrical power and light is obtained from the internal combustion engine-driven generator sets. Several of these sets are on the market equipped with G-E generators. These types of generators are also designed, and are available, for direct connection to gas engines of other manufacturers.

Publications:	G-E Bulletin
Gas-Driven Generator	42400

G-E5 Control and Distribution—Switchboard Data

For the control and distribution of current the General Electric Company offers a complete line of switchboards for all systems of electric distribution. These boards are equipped with latest improved instruments and controlling, measuring, and other devices.

All devices mounted on these boards are made by a single company, thus centralizing responsibility for the behavior of the entire switchboard and providing for the utmost efficiency in operation.

For the convenience or assistance of architects and consulting engineers, switchboard specialists are stationed in the principal branch offices of the Company. Architects and consulting engineers are invited to confer with these engineers in planning a switchboard to meet any unusual require-

ment or space condition. Sketches, detailed drawings, and specifications of any such special boards, or the adaptation of standard panels, will be furnished promptly on request.

While the General Electric Company will make any switchboard to meet any and every condition or requirement, it recommends, in the interest of economy and efficiency, that wherever possible fullest utilization be made of the very complete lines of standard panels which it has developed on the unit principle, known as:

(*A*) *G-E Standard Unit Switchboards.* These panels are so designed that they can be assembled in different combinations, to fit any usual condition and to form a complete switchboard having a neat uniform appearance, both front and back, all parts on the back being easily accessible. They are constructed for both direct and alternating current, complete with all switches, instruments and other equipment necessary.

They not only cost less than special boards but can be delivered quickly, completely equipped and ready for erection.

This is the most advanced system of switchboard manufacture and obviates the time and expense necessary when original specifications are drawn up for each individual installation by the architect, consulting engineer or contractor. Each panel is listed as a separate unit and has its own catalogue number. There are thousands of these "Standard Units," and they are listed in 22 separate lines for different classes of service.

(*B*) *Construction Notes on Standard Panels.*

(*a*) *Panels.*—All panels are of slate, those for isolated or small plants, of dull black marine finished slate, and for central station boards, of natural black slate. Slate is 1½ inches thick, with ⅜ inch bevel. Widths vary from 12 to 32 inches; height of panel varies from 20 to 90 inches. The sizes being determined by the instruments and controlling devices.

(Panels of marble can be substituted at prices which may be obtained from any of the G-E offices.)

(*b*) *Framework.*—A complete supporting framework of 1¼-inch pipe, with necessary fittings, is included for each panel. Total height never exceeds 90 inches.

(*c*) *Switches, Fuses, and Card-holders.*—The sizes and types of switches furnished with each panel are determined by amount of current carried, and their number depends upon the number of circuits which they control.

The fuses furnished in connection with switching apparatus open the circuits if overloads occur and protect the electrical apparatus.

One card-holder to designate the different circuits should be specified for each switch.

(*d*) *Connections.*—Each panel is furnished complete, unless otherwise specified, with small wiring on back of panel and with copper connections between the appliances which comprise the equipment of the panel.

The connections from generator to panel and from panel to all distribution points are invariably made by the electrical contractor and are not furnished by the manufacturers.

Publications.

The "Standard Unit" panel may be ordered direct from a bulletin. This is explained in G-E Index Bulletin No. 47001.

Details of framework are covered in G-E Bulletin No. 47750.

Rules governing the installation of switchboards will be found in the National Electrical Code, see Class A, Rules 3 and 4. Familiarity with all features of the Code, except details of manufacture, covered in Class D and supplemented by Underwriters' Laboratories' requirements and publications, is advisable on the part of all architects. The various rules epitomize the essential standards to be observed in installation and operation of all apparatus and devices.

Publications:	G-E Bulletins
Switchboards	"Standard Units" B-3303
Circuit Breakers	47502, 47503
Electrical Instruments	46013
Electrical Meters	42691, 46253, 46203

G-E6 Power Appliances—Electric Motors

The G-E motors cover a wide range of application of electric power to mechanical service. Constant and variable speed motors for both alternate- and direct-current service are built. Complete lines of these motors are manufactured, varying in size from 1-200 horsepower up to any requirement. Complete detailed information and illustrations pertaining to motors, with dimensions, space requirements and other data, will be furnished on request. State horsepower, voltage, frequency, etc., in making request.

Motors suitable for mounting on walls or ceilings can be furnished for installations where it is desirable to economize space.

Costs of installation can be greatly reduced by adhering to standard speeds. Contrary to the generally accepted idea, the cost of a motor of 1,800 RPM is less than that of a 1,200 RPM motor of the same horsepower. The 1,800 RPM motor is also smaller and lighter in weight.

The G-E service is available to all in connection with motor problems, and only those best adapted to the service required will invariably be furnished.

Publications:	G-E Bulletins
Induction Motors	41302
Direct Current Motors (constant speed)	41013
Direct Current Motors (variable speed)	A-4130
Direct Current Motors (crane and hoist)	48018

Q-E7 Transmission of Electrical Energy—Wiring and Conduit Data

It is a well-known fact that electricity is the simplest and easiest form of power to transmit. An old building is readily provided with a system of concealed wiring. A new building should be designed to accommodate the future as well as the present uses of electricity. One of the most important movements in this regard is the increasing use of electrical devices which consume more power than allowed on lighting circuits and, therefore, require heavier wiring. In any event, these devices can usually be operated at a lower cost if a separate wiring system on a power circuit meter is installed. Most electric companies give a lower rate when current is consumed on a special circuit in this manner, because such use represents a service furnished during the day when their equipment is not required to furnish current for the lighting service.

(*A*) *Power Plugs on Separate Circuits*

All power receptacles should be designed to take the same plug, and these should be made to fit only the power outlets, so as to prevent their attachment to the lighting circuits, which are not designed to carry the relatively heavy currents required by the power-consuming devices.

(*B*) *Locate Distribution Centers in Easily Accessible Places*

In planning various circuits, one should endeavor to locate distribution centers in easily accessible places, so that cutouts and switches controlling circuits can be grouped for convenience and safety of operation. The load should be divided as evenly as possible among the different circuits, and all complicated and unnecessary wiring should be avoided.

(*C*) *Provide for Future Uses in Installing Wires*

When installing wires, ample outlets should be provided in all rooms for future use, to take care of the rapidly increasing use of electric devices of various sorts, included in which may be mentioned: electric vacuum cleaners, portable lamps, all kinds of heating apparatus and electric ranges and cooking utensils, small motors for various industries in office and other buildings, and for silver buffing, ice-cream making, sewing-machine operation, dishwashers and washing-machine operation and for other conveniences in the home.

(*D*) *G-E Motor-driven Office and Home Devices*

As an indication of the almost unlimited possibilities in small electrically driven devices for home and office use it is of interest to note that there are on the market over three hundred of such with G-E motors attached.

(*E*) *Study the Standard Symbols for Directions and Suggestions*

For the greatest ultimate convenience and economy in the use of electricity, switches should be freely installed and receptacles placed at frequent intervals. Not only in the interest of standardization, but for the suggestions which will be afforded through the various conveniences which they provide for, it is recommended that the Standard Symbols for Wiring Plans as adopted by the National Electrical Contractors' Association and the American Institute of Architects be carefully studied at the time each installation is contemplated as well as followed in the marking of plans. These Symbols may be obtained or seen as indicated in the Index to this Industrial Section of the Journal.

(*F*) *Consult our Engineers about Present and Future Uses of Electricity*

The National Electrical Code, in the General Suggestions which preface the Code, distinctly urges architects, when drawing plans and specifications, to make provisions for the channeling and pocketing of buildings for electric light or power wires as well as for all other means of transmitting electrical energy. To this the General Electric Company, in the interest of affording all architects and owners the satisfaction which will eventually come with the fullest utilization of electrical energy in manners not now fully foreseen, repeats the further recommendation that a new building should be designed to accommodate the future as well as the present uses of electricity. The General Electric Company also offers the facilities of its engineering forces in forecasting these and in drawing attention to every present advantageous utilization.

(*G*) *The Question of Wire*

For the transmission of electrical energy wire in one form or another is invariably the conductor. From the source to the outlet, for whatever form of use, current must pass through insulated wire.

Not only architects, but owners of buildings are now more fully alive to the desirability of calling for wire by a given name or brand. The National Electric Code formulates the basis of manufacture which the Underwriters' Laboratories elaborates upon in its requirements which become a precedent to its label service signifying compliance. But discriminating architects and appreciative clients are no longer content to specify or pay for wire or conduit that is the "best quality or equal." In addition to requiring the use of that which has passed the code and received the label, they encourage the use of that which in the competition of service and not of price aims to excel in one point or another the product that does not identify itself or its maker.

More and more frequently a distinction is being made as to quality in materials of building construction, and stronger encouragement is being given to those producers who, in spite of competition, adhere to their standards of manufacture and make names for themselves under established brands.

(*H*) *Open Wiring and Conduit Work*

Whether run "open" or in conduits, the quality demands of the wire must remain the best. There is an ever-increasing trend toward the use of conduits, whether flexible or rigid, in which to incase the wiring in all buildings—on this point the General Suggestions of the National Electrical Code state "The use of wire ways for rendering concealed wiring permanently accessible is most heartily

endorsed and recommended; and the method of accessible concealed construction is advised for general use."

The *Quarterly* and other publications of the National Fire Protection Association are replete with instances where open and inferior wire has been the accredited cause of fires. In *Electrical Data*, one of the latest publications of Underwriters' Laboratories elsewhere referred to in the Journal, other instances are given. In the interests of safety and ultimate economy, conduit work is invariably recommended. Many cities now require this form of construction.

Nelson E. Thompson in "Mechanical Equipment of Federal Buildings" described under 6L in his chapter on "Conduit and Wiring Systems" states that all wiring in Federal buildings is run in rigid metal conduits.

(*J*) *G-E Wires and Cables*

Wires and cables are manufactured by the General Electric Company in varieties suitable for all uses of the architect. This product includes cable with weatherproof, flameproof rubber (National Electric Code and better grades to meet severer requirements), paper, varnished cambric, or asbestos insulation, and with all special finishes.

(*a*) *Rubber Insulation.*—Three types of rubber insulation have been standardized; Red Core, Tricoat and 30 per cent Para (black or white core). In addition we are prepared to manufacture special types and grades of rubber-insulated conductors to meet unusual conditions.

(*b*) *Red Core* is a high-class insulation used primarily on wires for house-wiring, and exceeds the requirements of the National Board of Fire Underwriters.

(*c*) *Tricoat* insulation was designed for those desiring a very high-grade wire, somewhat better than Red Core, but less expensive than the 30 per cent grade.

(*d*) *30 per cent Para* insulation meets the Specifications of the Rubber-Covered Wire Engineers' Association and is the best rubber compound for absolutely high-grade work. The core may be white or black, as desired.

(*e*) *Braided Wire.*—All wires and cables No. 8 B. & S. and smaller carry a single braid, while No. 6 B. & S. and larger are regularly made with either 2 braids or a tape and 1 braid; which, in accordance with Underwriters' requirements, is equal to double braid and suitable for conduit work. If tape and 2 braids are required, an extra charge will be made.

(*f*) *N. E. Code, Red Core,* braided, twin wire is finished with talc, which assures ease in pulling wire into conduits; no extra charge made for this feature. All our braided, rubber-covered wires may be finished in this way, if desired, without additional cost.

Our rubber-covered braided wires and cables are distinguished by 1 red and 1 black thread woven parallel in braid.

(*g*) *Weatherproof and Underwriters' Cable.*—Standard weatherproof wires and cables are manufactured strictly in accordance with the requirements of the National Board of Fire Underwriters, with 3 braids placed directly over the copper core, thoroughly impregnated with a black, weatherproofing compound, and then polished to remove all superfluous compound and give a smooth exterior finish. Double-braid weatherproof wire furnished on order.

When the number of braids is not specified, wire with 3 braids commonly called triple braid, is always furnished; if double braid is required, requisitions or requests for quotations should so state. A stock of triple-braid wire is carried.

(*K*) *Steel Armored Conductors: A Safe and Economical Method of Wiring Old Buildings (also New)*

These consist of insulated wires with interlocking convex and concave galvanized steel strips wound spirally over the insulation.

Recognizing the necessity for a system of wiring which would be flexible, safe, economical and easily installed without disfiguring walls, ceilings, or decorations in existing buildings which were not originally wired for electricity and in which it became desirable to have the comforts and conveniences which electrical appliances afford, the Sprague Electric Works of General Electric Company eighteen years ago placed on the market a line of flexible armored conductors under the trade name "B. X." These have been constantly adding to a well-earned enviable reputation.

Specify Greenfield "B. X." flexible steel armored conductors, which in addition to use in existing buildings are equally well suited for new work as they make a safe, economical wiring system.

This Greenfield Sprague product is also made in cables known as "B. X. L." which are covered by a continuous lead sheath over which the steel armor is wound. These are admirably suited for use in wet places and when embedded in concrete.

Publications: Sprague Bulletin No. 49600.

(*L*) *Flexible and Rigid Conduits*

(*a*) *Greenfield Flexible Conduit* is equal in flexibility to the above mentioned armored wires or conductors and can be used in a great many cases where it would be impracticable to use rigid conduit, particularly in finished building work.

This is made in Single Strip type and Double Strip type and is invariably furnished galvanized inside and out. For existing buildings the use of Double Strip Conduit is recommended on account of its extreme flexibility.

See Sprague Bulletin No. 49600 for all data on these conduits and for couplings, outlet, junction and switch boxes, covers and all fittings for conduits and armored conductors.

(*b*) *Greenfielduct* is a rigid pipe or conduit developed by Sprague Works. It is treated on both the interior and exterior by a patented hot galvanized wiped process making the galvanization of both surfaces and pores thoroughly effective. The interior is afterward given a black Japan finish the accidental removal of which will not impair the integrity of the conduit. This conduit is easily bent for installation and is proof against rust, cracking, flaking, and caking.

The enameling on the interior is *not* for the purpose of rust prevention as in some makes of galvanized conduits, but merely for identification of the product as an electrical conduit as required by the National Electrical Code, Rule 58-f.

(*c*) *Spragueduct* is a black enameled rigid conduit of the highest type to be used where item of expense is a consideration. The use of the galvanized or Greenfielduct is recommended as the cost is but approximately 7½ per cent more than the black pipe.

See Sprague Pamphlet No. 117 and other folders for data on (*b*) and (*c*).

(*M*) *Sizes and Methods of Installing Conduits*

(*a*) *Code and Underwriters' Requirements*

The National Electrical Code prescribes the sizes, methods of elbowing, cutting, supporting and installing

conduits, and the Underwriters' Laboratories, standards obtain in manufacturing and labeling.

For the convenience of architects and engineers the National Electrical Contractors' Association has published a chart diagrammatically illustrating the Code requirements. This may be obtained as mentioned under 6A4*b*.

The brief summary and the table which follows will be of help in familiarizing readers with the more detailed requirements of the Code.

(*b*) *Circuits Permissible in One Conduit*

The same conduit must not contain more than four 2-wire or three 3-wire circuits of the same system, except by special permission of the Inspection Department and must never contain circuits of different systems.

No conduit tube having an internal diameter of less than ⅝ inch shall be used. All elbows or bends must be so made that the conduit, or lining of same, will not be injured. The radius of curve of the inner edge of any elbow not to be less than 3½ inches. Must have not more than the equivalent of four quarter bends from outlet to outlet, the bends of the outlet not being counted.

(*c*) *Supporting Conductors in Vertical Conduits*

In tall buildings special provision must be made to support the conductors in the vertical conduits, to remove their weight from their connections, and spacing of supports in such cases is prescribed in the Code.

In laying out conduit work, first ascertain the size and number of wires required, then take the size of conduit from the table in next column.

SIZE OF CONDUITS FOR THE INSTALLATION OF WIRES AND CABLES

NUMBER OF CONDUCTORS IN SYSTEM

	One Conductor in a Conduit Size Conduit, Ins.	Two Conductors in a Conduit Size Conduit, Ins.	Three Conductors in a Conduit Size Conduit, Ins.	Four Conductors in a Conduit Size Conduit, Ins.
Size B & S	Electrical Trade Size	Electrical Trade Size	Electrical Trade Size	Electrical Trade Size
14	½	½	½	¾
12	½	¾	¾	¾
10	½	¾	¾	1
8	½	1	1	1
6	½	1	1¼	1¼
5	¾	1¼	1¼	1¼
4	¾	1¼	1¼	1½
3	¾	1¼	1¼	1½
2	¾	1¼	1½	1½
1	¾	1½	1½	2
00	1	1½	2	2
00	1	2	2	2½
000	1	2	2	2½
0000	1¼	2	2½	2½
CM				
200000	1¼	2	2½	2½
250000	1¼	2½	2½	3
300000	1¼	2½	2½	3
400000	1¼	3	3	3½
500000	1½	3	3	3½
600000	1½	3	3½	
700000	2	3½	3½	
800000	2	3½	4	
900000	2	3½	4	
1000000	2	4	4	
1250000	2½	4½	4½	
1500000	2½	4½	5	
1750000	3	5	5	
2000000	3	5	6	

G-E8 Local Centers of Distribution—Panel Boards and Cabinets

The next step in installation is the local distribution through the various circuits of the current brought by the feed-wires from the main source of control.

(*A*) *Panelboards*

G-E panelboards are compact and well finished, possess high-grade features throughout, and represent the latest and most satisfactory devices on the market. We can furnish a complete line of standard panels and are prepared to furnish promptly special panels to meet the most exacting specifications.

(*a*) *Switches.*—Individual circuits with the following arrangements can be supplied:

Fused terminals. Knife switches, punched clip or sweated and pinned. Rotary snap switches, moulded covers. Push button switches, moulded covers. Safety type rotary snap switches. Safety type push-button switches.

Any of the above types may be fused between buses and switches, or outside of switches, with NEC enclosed, Edison plug or open link fuses.

Publications: See Supply Catalogue, and for Remote Control Switches, G-E Bulletin A-4070.

(*b*) *Mains and Branches.*—Highest grade copper, having 98% conductivity, is used for the mains and branches. The main terminals, bus bars, switches, and fuses are designed for a capacity of 6 amperes per circuit on 2 to 2 wire and 3 to 3 wire 125-volt panels, and 3 amperes per circuit on 3 to 2 wire 125-volt and 2 to 2 wire 250-volt panels. Mains can be arranged for lugs only, NEC enclosed or open link fuses, or with fused or unfused main switch.

(*c*) *Frames.*—By the use of a slate frame or set of barriers around the panel, a more finished appearance is given, as it separates the wiring in the cabinet from the active part of the panel.

This frame consists of four pieces of slate mounted on the face of the panel and fastened to the back of the cabinet by adjustable corner irons. The slot in the frame opposite each terminal, through which the wire passes, permits the complete wiring of the panel before the slate frame is placed in position and simplifies the work of connecting the circuit wires.

(*d*) *Finishes.*—Any finish desired or called for in specifications can be furnished, but the General Electric Company strongly recommends its No. 1, or dull black slate, with satin finished bar and branch connections. This is a very durable finish and renders the appearance of the panel very attractive.

(*B*) *Safety-type Panels—*

This type of panel has been developed by Sprague Electric Works of the General Electric Company to meet an increasing demand for a strictly high-grade safety type of panel. It is so arranged that the switch compartment is covered by a door, fastened with a spring catch, while the fuse compartment is covered by a larger door, supplied with a lock. By this construction only authorized persons may have access to that part of the panel which is alive.

These panels are arranged for either push-button or

rotary-snap switches, and NEC enclosed, open-link or Edison plug fuses in the branches.

Salient features.—Switches operated without opening door exposing current-carrying parts.

All live metal parts covered by locked door, eliminating possibility of shock to operator.

Unit switch construction.

Plates may be engraved with name or number of circuit controlled.

Recommended for use in all public places, department stores, private residences, factories, or any place where the switches are likely to be operated by persons unfamiliar with the damage or possibility of personal injury caused by short circuit or accidental contact with live conductors.

(C) Panelboard Cabinets.—The General Electric Company has developed a complete line of standard construction cabinets in steel and wood with solid and glass doors and with and without trims. These can be furnished in any color or finish desired.

In addition to the standard line, special cabinets can be supplied to meet any requirement, but holding to the standards will effect an economy and facilitate prompt delivery.

G-E9 G-E Switches for Every Use

(A) G-E Lever and Knife Switches are constructed to withstand severe and constant usage, and they will carry their rated capacity indefinitely without overheating. Moreover, they embody certain other minor details of construction which, though not essential, add considerably to their efficiency.

(B) Snap Switches.—The General Electric Company manufactures a line of mechanically and electrically efficient snap switches in all standard rating, too numerous to be listed here.

(C) G-E Flush Switches, both push-button and rotary types, are known for their absolute reliability. They are furnished with adjusting nuts, which feature insures accurate alignment. The locking type is recommended for use in public buildings, to prevent the switch from being operated by unauthorized persons. Flush switch plates can be furnished in any finish required. White enameled plates should be used with delicately tinted walls and woodwork, and in bathrooms and toilets.

(D) Luminous Radieye.—The self-luminous "Radieye" pull-socket pendant or switch-plate attachment enables one to locate the exact spot for turning on the light, even from across the room.

These attachments contain an actual radium composition protected by glass. The luminosity is thus practically permanent. The body is made of brass with all standard finishes and can readily be attached to either pull-socket chain or switch-plate without the aid of tools.

(E) Removable Mechanism, Flush Push-Button Switch.—Constructed especially to comply with the restriction of the Underwriters in regard to having loose wires in buildings during erection. With this type of switch, only the porcelain box, with a temporary fiber cover, is installed with the wiring during plastering and other rough building operations. The removable mechanism, separately packed, is retained, ready for insertion as soon as there is no longer any danger of injury to it.

(F) Remote Control Switch.—The Type R, Form C-2, electrically operated remote control switch can often be used to advantage to connect and disconnect lighting circuits, motors not subject to heavy overloads, vacuum cleaners, or other electrical devices located at a distance. It is especially adapted for use in large buildings, libraries, theaters, halls, stores, etc., where control from a central point is desired.

Publications: See Supply Catalogue. For Remote Control Switches, see G-E Bulletin A-4070.

G-E10 Sockets and Receptacles

The standard and special lamp sockets made by this Company cover all possible requirements in electric installation.

(A) G-E Quick Make and Break Socket, 660 watts, 250 volts, fills a long-felt need for a key or pull socket which can be used interchangeably with keyless socket and switch control where electric heating devices and other small portables are used on lighting circuits.

(B) G-E Locking Sockets and Receptacles afford a positive protection to lamps and also prevent the theft of current. When the key is removed, the screw shell of the socket swivels freely, preventing injury to either the lamp base or the socket if an attempt is made to remove the lamp without the key.

(C) Double Door Flush Receptacle.—When installed in the wall or baseboard, only the small porcelain flange of the plug is visible. Two perfectly fitting doors in the plate open to allow the insertion of the plug.

(D) Flush Receptacles for Electric Portables.—This flush receptacle will take any medium screw base attaching plug. Catalogue No. GE002, for instance, is a miniature swivel plug, and is particularly well adapted to use with small electric portables in connection with receptacle, Catalogue No. 36817. The swiveling feature prevents the cord from twisting when the plug is screwed into the receptacle.

The very complete line of wiring devices manufactured by this Company includes a variety of other flush receptacles for use as outlets for various electric portables. For suggestions for use see Wiring and Conduit Data, G-E 7*C*.

Publications: See Supply Catalogue.

GE11 Utilization of Electrical Energy

(A) Cooking and Heating

A wide range of domestic appliances is now practical for the modern building. These devices are of vital interest to the architect in two ways. First, because the value of the complete structure as a working unit can be vastly increased by their use, and, secondly, because special wiring is invariably required and should be provided for

in the original plans of the building. By installing separate wiring circuits and meter, as before stated, the charges for current consumption will be much lower than for lighting circuits.

Since the limit established by the Underwriters is 660 watts from a lighting circuit wire, the architect can readily determine the advisability of a separate circuit by noting the wattage of the various devices which will probably be used. Kitchen ranges, three-unit and four-unit radiators, circulating water-heaters and air-heaters, for instance, are above the 660-watt limit, and must, therefore, be connected to the special power circuit wire.

The General Electric Company offers a complete line of electric heating and cooking appliances for domestic, hotel, and restaurant installations and industrial applications.

(*B*) *Electric Ranges.*—Are easy to operate, the heat is quickly available, and is readily regulated. They are clean, safe, and labor-saving, and their use promotes comfort and cleanliness. There is no fire requiring constant attention; no excess heat, smoke, or fumes to vitiate the atmosphere. There is no longer need of continued scouring and scrubbing to keep cooking utensils clean and free from soot. Dust and dirt, together with the bother and burden of handling and storing coal and ashes, are entirely eliminated. The same current will always produce the same temperature; therefore, other things being equal, uniform results are obtained.

The electric range performs all kinds of cooking and baking. Ordinary cooking utensils are used with them. The broiler is combined with the oven, the meat being broiled by radiant heat from above. The cooking top is equipped with hot plates for boiling and frying and electric cookers for steaming and slow cooking.

(*C*) *Flatirons.*—3-, 6-, 8-lb. sizes. With separate or attached stand. Full nickeled or with barffed base.

(*D*) *Tailors' Irons.*—For tailors, clothing houses, and pressing-rooms in private residences, etc. Made in 12-, 15-, 18-, and 24-lb. sizes.

(*E*) *Stoves.*—Portable disks for many purposes. 4-in., single heat. 6-in. and 8-in., 3 heats each.

(*F*) *Hot Plate.*—Does the same work as the ordinary gas hot plate.

(*G*) *Toaster.*—Convenient and ornamental for use on the dining-toom table. Makes fresh toast as needed. Ten slices cost but one cent.

(*H*) *Air-Heaters.*—Particularly adapted for the heating of rooms in buildings or residences where the heat is to be used continuously. The heating units are so constructed as to allow a free passage of air over the heating element, the heat being rapidly conducted away to the surrounding air. Heating units easily renewable. Snap-switch heat-control.

(*J*) *Glower Radiators.*—Adapted for intermittent service, particularly in removing the chill before or after the heating system is in use. Ideal for nurseries and bathrooms. Consists of a handsomely finished ornamental metal frame with a highly polished reflector, and two, three, or four luminous heating units. Safety from danger of fire or fumes.

(*K*) *Circulating Water-Heater.*—The circulating water-heater may be readily connected with the ordinary kitchen hot-water tank.

It is designed for low wattage continuous heating, but the larger wattages adapt it for intermittent use.

No tank, piping or switches furnished.

Publications:	G-E Bulletins
Ranges, Domestic	B-3353
Disk Stoves, Domestic	B-3410
Radiant Grill, Domestic Table	B-3278
Ranges, Hotel	Y-898
Broiler, Hotel	Y-898
Ovens, Hotel	Y-898
Toaster, Hotel	Y-898
Air Heaters, Domestic	B-3423
Luminous Radiator	B-3329
Irons, Flat, Domestic	B-3318
Irons, Flat, Tailors'	B-3394

G-E12 *Hotel Equipment*

The complete G-E line consists of ranges, boilers, bake-ovens, toasters, and all other desirable utensils. Information in detail may be obtained from the nearest G-E office.

G-E13 *Special Transformers*

For small devices, such as bells, toys, small lamps, etc., the use of batteries has been replaced by small transformers which give the required low voltages at a small cost and without attention. Transformers can be used only on alternating current systems.

(*A*) *For Night Light.*—A miniature transformer (the All-nite-lite) is screwed to the lamp-socket in place of the ordinary lamp, and transforms the supply voltage to operate a 6-volt 2-c.p. bayonet base Mazda lamp, the same as used for automobile rear and speedometer lighting.

Publications: G-E. Bulletin B-3341

(*B*) *For Bell-Ringing Systems.*—The Wayne bell-ringing transformer serves every ringing requirement. Catalogue No. 179541, for instance, is adapted for operating household type electric bells, annunciators, door-openers, thermostats, etc. It has sufficient capacity to operate three 3-inch bells simultaneously. It has been approved by Fire Underwriters.

A bell-ringing transformer should be included in all wiring specifications.

Publications: G-E Bulletin B-3400

G-E14 *Fans*

Fans for residences and offices are made in three sizes, 9, 12 and 16 inches in diameter, and with three-speed control except the 9-inch, which has a two-speed control. Can be furnished for desk or wall mounting, either oscillating or non-oscillating. These fans are quiet in running, light in weight, very efficient and durable. Made for different voltages for both alternating and direct current.

Publications: G-E Bulletin B-3402. *For Ventilation of Buildings* by use of electric blowers, fans and exhaust fans, ask for Special Bulletin devoted to this subject.

G-E15 *Battery Charging Outfits*

Electrically propelled vehicles demand reliable charging equipments of high commercial efficiency. Battery charging equipments of all kinds can be furnished by the General Electric Company, either as individual charging sets with control panels for private garages or in large equipments for charging vehicle batteries in public garages.

Publications: G-E Bulletin B-3374

(*A*) *Individual Vehicle Charging Sets* may be used for charging either Lead or Edison vehicle batteries.

(*B*) *Ignition Battery Charging Outfits* can be supplied for home or garage use in charging automobile starting and ignition batteries. In the case of large garages it is best to take up individual requirements with the engineers of the General Electric Company.

G-E16 *Moving Picture Apparatus*

Fort Wayne Compensarcs for the production of voltage incident to the operation of moving-picture machines. Used for transforming direct or alternating current and transforming alternating to a usable direct current voltage. Simple to install; no sub-base or special foundations required; easily connected into circuit.

G-E17 Illumination—Interior and Exterior

Illumination has become one of the modern sciences. Its practice has developed the profession of illuminating engineering. The commercial demands for lighting efficiency, the varied effects both on the exterior and interior of buildings which may be produced by artificial lighting and the development of a wide range of methods and devices for diffusing and directing light have necessitated specialized study such as now comes within the province of the illuminating engineer. There still remain the simple problems of modern lighting practice.

It is not here possible to explain the comparatively easy calculations involved in the design of a simple lighting installation. For information on this subject the reader is referred to the numerous handbooks and publications listed under the subdivision 6H in this issue of the Journal. Further information is always obtainable from reputable manufacturers of lamps and lighting appliances who issue such data in convenient and reliable form.

Publications: The Ivanhoe-Regent Works of the G-E Company issues a complete catalogue on this subject, which is sent on application. See Bulletins of Edison Lamp Works of the G-E Company on Modern Lighting Methods in various Industries.

(*A*) *Arrangements of Lighting Systems—Interior*

Under the three following designations the lighting systems in modern practice are briefly outlined:

(*a*) *Local Lighting.*—Denotes concentrated illumination under small spaces, such as a lamp over a tool or machine or a piece of furniture.

(*b*) *General Illumination.*—Denotes an attempt to diffuse the same intensity of light throughout an entire room.

(*c*) *Localized General Illumination or Group Lighting.*—Denotes, roughly, a compromise between the two previous systems and suggests the placing of lamps to give proper direction of light and maximum intensity at important points.

(*B*) *Types of Lighting Units*

(*a*) *Direct Lighting.*—Denotes a type of lighting unit such as the clear or frosted incandescent lamp, where the light is not deflected by the ceiling or other reflective surfaces.

(*b*) *Indirect Lighting.*—Denotes a lighting unit, such as cove lighting or lamps concealed by inverted opaque reflectors, which reflect all the light on a ceiling or some other large surface, whence it is re-reflected in desired directions.

(*c*) *Semi-indirect.*—Denotes a light in which a translucent reflector is used. By this means most of the light is reflected to the ceiling or any other large surface, while a small portion of the light is transmitted directly through the reflector.

(*C*) *Choice of a Semi-indirect Unit*

The type of lighting unit which is best is a matter which does not fall within our province and upon which we express no opinion. Present practice tends toward the use of the semi-indirect method which is susceptible of wide variations according to the density of the bowl or reflector which governs their translucent quality. This density, in its direct application, is of course governed by the needs where it is used and each problem requires different treatment. In order that the lights may be evenly deflected from the bowl to the ceiling, the fixture or hanger should be carefully calculated as to length, and the proper position of the socket accurately determined. Wherever feasible, glass should be used which is smooth on the inside and on the outside also, if possible. Rough glass collects dirt and is not easily cleaned. The suspension should be such as to eliminate all danger of falling glass and should provide convenient means for cleaning. Decorations should be very simple, avoiding deep crevices, which invite dust accumulation.

(*D*) *Exterior Lighting*

The G-E Novalux ornamental units are well designed and are practical units built to accommodate the Mazda C lamp. They are used for lighting streets and sidewalks and for throwing light upward to illuminate building fronts. They combine lighting efficiency with an attractive appearance and are made for all standard lighting circuits and candle powers.

Publications: Information may be obtained at our nearest office; see page XII*b*.

(*E*) *Flood Lighting Projectors*

Since the extensive use of flood lighting as applied to the exteriors of the buildings at the Panama-Pacific International Exhibition, the illumination of building exteriors has attained considerable prominence and popularity, due to the fact that the building and not the lighting method is presented to the eye.

The G-E Flood Lighting Projector is made expressly for this work and accommodates either the 200- or 400-watt Mazda C lamps, which also are made expressly for this purpose.

Publications: See G-E Bulletin No. 43850

(*F*) *For all Types of Illumination*

Complete equipment, including glassware and lamps, is furnished by the General Electric Company and its subsidiaries.

For Opal Glass Reflector, Regent Semi-Indirect Bowls, Holophane Prismatic Reflectors and all other lighting units, as well as for general information on the subject of illumination, including that from concealed sources, consult various General Electric publications.

(G) Lamps

The Mazda is the standardized lamp for all general uses. Mazda is not the name of a thing but the mark of a service, centered in the General Electric Research Laboratories at Schenectady, N. Y. The trade-mark, which is the property of the G-E Company, can appear only on lamps which meet the standard of Mazda service.

G-E18 Generation, Transmission, Distribution and Application of Electric Power Everywhere

Other products meeting every known requirement in electrical installation, as well as the equipment of buildings, are produced, including those for all industrial establishments, power-houses, hotels, apartment houses, residences and all other types of structures.

As before mentioned, the engineering staff and various departments of the General Electric Company are available to all architects and engineers through the principal works and sales offices of the General Electric Company which are established through the United States, Canada and foreign countries. See below.

The principal manufacturing plants of the General Electric Company are located at Schenectady, N. Y.; Lynn and Pittsfield, Mass.; Harrison, Newark and Watsessing, N. J.; Cleveland, Ohio; Erie, Pa.; and Fort Wayne, Ind. The total floor space is nearly 15,000,000 square feet.

To insure correspondence against avoidable delay, all communications to the Company should be addressed to the sales office nearest the writer.

THE SALES OFFICES OF THE GENERAL ELECTRIC COMPANY ARE AS FOLLOWS:

Atlanta, Ga.	Third National Bank Building
Baltimore, Md.	Lexington Street Building
Birmingham, Ala.	Brown-Marx Building
Boston, Mass.	84 State Street
Buffalo, N. Y.	Electric Building
Butte, Mont.	Electric Building
Charleston, W. Va.	Charleston National Bank Building
Charlotte, N. C.	Commercial National Bank Building
Chattanooga, Tenn.	James Building
Chicago, Ill.	Monadnock Building
Cincinnati, Ohio	Provident Building
Cleveland, Ohio	Illuminating Building
Columbus, Ohio	Columbus Savings & Trust Building
*Dallas, Tex.	Interurban Building
Dayton, Ohio	Schwind Building
Denver, Col.	First National Bank Building
Des Moines, Iowa	Hippee Building
†Detroit, Mich.	Dime Savings Bank Building
Duluth, Minn.	Fidelity Building
Elmira, N. Y.	Hulett Building
*El Paso, Tex.	500 San Francisco Street
Erie, Pa.	Marine National Bank Building
Fort Wayne, Ind.	1600 Broadway
Hartford, Conn.	Hartford National Bank Building
*Houston, Tex.	Third and Washington Streets
Indianapolis, Ind.	Traction Terminal Building
Jacksonville, Fla.	Heard National Bank Building
Joplin, Mo.	Miners' Bank Building
Kansas City, Mo.	Dwight Building
Knoxville, Tenn.	Bank & Trust Building
Los Angeles, Cal.	724 S. Spring Street
Louisville, Ky.	Starks Building
Memphis, Tenn.	Randolph Building
Milwaukee, Wis.	Public Service Building
Minneapolis, Minn.	410 Third Ave., North
Nashville, Tenn.	Stahlmann Building
New Haven, Conn.	Second National Bank Building
New Orleans, La.	Maison-Blanche Building
New York, N. Y.	120 Broadway
Niagara Falls, N. Y.	Gluck Building
*Oklahoma City, Okla.	Terminal Building
Omaha, Neb.	Union Pacific Building
Philadelphia, Pa.	Witherspoon Building
Pittsburgh, Pa.	Oliver Building
Portland, Ore.	Electric Building
Providence, R. I.	112 Turks Head Building
Richmond, Va.	Virginia Railway and Power Building
Rochester, N. Y.	Granite Building
Salt Lake City, Utah	Newhouse Building
San Francisco, Cal.	Rialto Building
Schenectady, N. Y.	G-E Works
Seattle, Wash.	Colman Building
Spokane, Wash.	Paulsen Building
Springfield, Mass.	Massachusetts Mutual Building
St. Louis, Mo.	Pierce Building
Syracuse, N. Y.	Onondaga County Savings Bank Building
Toledo, Ohio	Spitzer Building
Washington, D. C.	Evans Building
Youngstown, Ohio	Stambaugh Building

†General Electric Company of Michigan.
*Southwest General Electric Company.
For Hawaiian business address
Catton Neill & Company, Ltd., Honolulu.
For all Canadian business refer to
Canadian General Electric Company, Ltd., Toronto, Ont.

For business in Great Britain refer to
British Thomson-Houston Company, Ltd., Rugby, Eng.

General Foreign Sales Offices: Schenectady, N. Y.; 120 Broadway, New York City; 83 Cannon St., London, E. C., Eng.

FOREIGN OFFICES AND REPRESENTATIVES

ARGENTINA: Cia. General Electric Sudamericana, Inc., Buenos Aires; AUSTRALIA: Australian General Electric Co., Sydney and Melbourne; BRAZIL: Companhia General Electric Co., Brazil, Rio de Janeiro; CENTRAL AMERICA: G. Amsinck & Co., New York, U. S. A.; CHILE: International Machinery Co., Santiago, and Nitrate Agencies, Ltd., Iquique; CHINA: Anderson, Meyer & Co., Shanghai; COLOMBIA: Wesselhoeft & Wisner, Barranquilla; CUBA: Zalso & Martinez, Havana; ENGLAND: General Electric Co. (of New York), London; INDIA: General Electric Co. (of New York), Calcutta; JAPAN and KOREA: General Electric Co. and Bagnall & Hilles, Yokohama; Mitsui Bussan Kaisha, Ltd., Tokyo and Seoul; MEXICO: Mexican General Electric Co., Mexico City; NEW ZEALAND: The National Electric & Engineering Co., Ltd., Wellington, Christchurch, Dunedin and Auckland; PERU: W. R. Grace & Co., Lima; PHILIPPINE ISLANDS: Frank L. Strong Machinery Co., Manila; SOUTH AFRICA: South African General Electric Co., Johannesburg, Capetown and Durban.

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